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System Protection

Coping with Transient Faults

WHATEVER may have been the position in earlier years, it is evident that nowadays, with the increasing variety of tasks performed by electricity on farms and in farmhouses, continuity of supply has become a major necessity in rural development. Indeed the standard of reliability should be comparable with that attained in more densely populated districts, especially having regard to the effects of any failure on such applications as incubation and horticultural heating. On the other hand the usually scattered nature of the load entails a greater regard to economy. Conditions, too, tend to be more severe owing to the use of overhead lines.

Four I.E.E. Papers

Of the four papers on protective systems presented before the I.E.E. Transmission Section last week, those by Mr. D. C. Field and by Messrs. R. W. Steel and A. W. Allwood, related to rural distribution up to 33 kV; a third (by Mr. O. Howarth), in contrast, discussed a duplicate 11-kV feeder system mainly for dealing with relatively heavy demands; and the last one (by Mr. K. J. Brown) described an ingenious method adopted in India for the protection of 37·5-kV transmission lines by means of arc-suppression coils, which are features of the first two papers also.

As a test of efficiency of protective methods the number of interruptions, whether taken per mile, per substation or per consumer, has to be related to the length of time involved. This is especially so in rural areas, where appreciable time may elapse before a fault at a remote spot can be rectified.

Fortunately, a substantial proportion of overhead-line faults are transitory, the average of two-thirds given by Mr. D. C. Field being very close to other recorded figures. The most promising initial line of attack lies, therefore, in mitigating the effects of transient faults. Auto-reclose circuit-breakers have justified their installation on the more inaccessible parts of the system, though improvements in certain details which he mentions seem called for. A point to be settled is the number of reclosures before final lockout of the breaker; opinions vary as between one and four. If the figure of 20 per cent. of transients cleared on second attempt, mentioned by Mr. R. B. Anderson recently (*I.E.E. Journal*, March 1943) is found to be general, more than one reclosure would seem desirable.

Arc Suppression Coils

In his satisfactory experience during eight years of arc-suppression coils as a means of clearing transient faults, Mr. Field receives support from Mr. Brown as well as from Messrs. Steel and Allwood. His use of them to cover sustained faults also, by eliminating the usual time-delay short-circuiting switch, is less orthodox, but the insulation of the system seems not to have been unduly stressed thereby after the initial showing up of weak spots.

These four papers, all based on advanced

practice, are most instructive. Their range, however, is limited to certain undertakings. This brings us to a suggestion by Messrs. Steel and Allwood, which reinforces the plea by Mr. J. Eccles in our last issue for fuller exchange of information on operation and maintenance problems among supply engineers. If returns relating to high-voltage faults were made to a central committee representing supply engineers and also, we would add, manufacturers of transmission apparatus, the issue of an analysis of causes and remedies to those concerned would be of invaluable help in promoting reliability of supply.

In Between

A BRIEF subsection of the I.E.E. Annual Report (reviewed by us last week) relating to the scope of the Institution carries a number of implications. There are very many electrical engineers holding supervisory or equivalent positions whose technical qualifications fall short of the high standard requisite for membership in any of the existing classes of a chartered professional body. The Institution has given a lead to the industry in the training of craftsmen and it seems logical that it should also interest itself in the needs of those who perform essential services to electrical engineering in more responsible capacities.

Motor Dimensions

MR. H. MARRYAT'S proposals for standardising leading motor dimensions produced the discussion at the I.E.E. for which he had expressed a hope. Criticisms were directed in the main at his remark that design had approached finality, a remark which could easily be misunderstood. Actually his paper was limited to "off-the-shelf" machines of from 1 to 50 HP and he avoided the pitfall of tying up dimensions with horse-power. Some criticism was evidently inspired by a healthy suspicion of standardisation for its own sake and may perhaps be modified in the light of Mr. Marryat's explanation in his reply to the discussion.

Special Motors

POSSIBLY the relative importance of the "off-the-shelf" motor will not be so great in future. The influence of the war on the industrialists' outlook towards materials handling and on the status of machine-tool motors, for example, is likely to remain. In these the dimensions of the motor are subordinated to the design of the machine driven. The development of heat-resisting insulating materials, such as glass (held up by the outbreak of war) and synthetic enamels offer a further prospect of reducing size and weight per horse-power, since for increased output permissible temperature rise is the dominating factor. This may be considered to present another argument against relating physical dimensions to horse-power.

Rural Rating

IN our recent series of articles on "Improving Electricity Supply" we referred to the advanced stage reached in the supply of electricity to small rural communities. Even better progress would, no doubt, have been made but for the burden of local rates imposed immediately a mains extension has been made. As Mr. P. Rycroft told the I.E.E. Transmission Section last autumn, parochial rates (which are assessed on varying and usually unascertainable principles) generally wipe out any profit during the first few years. It would undoubtedly encourage rural development if local authorities could be got to agree not to levy rates until the Electricity Commissioners had certified that the supply undertaking was obtaining an adequate return.

"Chiefs'" Salaries

SINCE the Association of Municipal Corporations published its report animadverting upon the salaries scheme of the National Joint Committee of Local Authorities and Chief Electrical Engineers, the Derby Corporation has sent a circular letter to other municipal councils asking for support in a protest against the agreement. As the adoption of the agreement is quite a voluntary matter it is not clear why a protest is necessary, particularly as the Derby Corporation has decided to pay the agreed salary to its own engineer.

"Impertinence"

THE A.M.E.E. seem to have aroused a great many local councillors to indignation. For instance, at a meeting of the Stalybridge, etc., Transport and Electricity Board reference was made to a request from the A.M.E.E. that effect should be given to the agreement in

respect of the Board's chief engineer, Mr. J. H. Lumsden. This was described by one of the members as "a piece of impertinence" and "a slight on the intelligence of the Board"—rather strong words in the circumstances.

Electricity and Babies

A MEMBER of the Grimsby Electricity Committee speaking in a recent discussion upon electrical engineers' salaries, said that the practice of paying these men more money for increased output could not be justified. He considered that it would be as reasonable to pay the borough surveyor extra for every street opened, the chief constable on convictions, or the medical officer on the birth rate. He evidently was not aware that a capable electrical engineer can do much to increase the sales of electricity, but that the most competent medical officer can bring but little influence to bear on the birth rate. And who wants to encourage chief constables to produce a bigger "output" of convictions?

Is Competition Wasteful?

MAJOR LLOYD GEORGE apparently supports the exploded idea that only lighting can be said to be definitely electrical, while heating is solely the domain of gas. In between these extremes, as he called them at a Fuel Luncheon Club gathering, lies debatable ground which, however, must not be the subject of "wasteful competition" between gas and electricity. Once more we challenge the Minister to prove that a rivalry which has so improved service to the public and at the same time lowered prices, without affecting the economic soundness of either industry, is "wasteful." Looking at the matter purely from the fuel economy point of view (which is the only one that should concern Major Lloyd George), had it not been for competition both industries might have continued to use a very much greater quantity of coal in relation to their output than they now do.

Gas Support

THE opinion expressed above is not purely an electrical one. In a recent address, reported in the *Gas Times*, Dr. Harold Hartley (Radiation, Ltd.) said: "We [the gas industry] must, however, have competition to keep us effective and we ought really to give thanks for the existence of competitive interests of sufficient intelligence and energy to keep us on our toes. . . . The electrical people are losing no time in staking their claims for the use of electricity. As an individualist I welcome their competition. I feel we, the gas industry, owe more to the electrical industry than is generally appreciated. Had it not come into existence as a competitor we should not have developed as rapidly as we have done during the last forty years." Dr. Hartley stressed the strength of the competitive power of gas on a fuel or cost basis, but said that political considerations would prevent the introduction of drastic changes.

Substantial Fuel Economy

ELECTRIC power stations, in common with other users, nowadays have to take pretty well what they are given in the way of coal. The result has been a great deal of trouble in the boiler house and a lowering of efficiency. But apparently the electricity supply industry has again triumphed over circumstances as it has done so many times during the war. Sir Johnstone Wright, at last week's Fuel Luncheon Club meeting, said that the worsening process had now been arrested and improvement had again been registered. Sir Johnstone reminded the gathering that owing to improved efficiency and the operations of the Central Electricity Board the consumption of coal for the generation of electricity in 1942 was only 22 million tons; without these improvements it would have amounted to 50 million tons.

Salvage Wardens

AT the very commencement of the paper salvage campaign we suggested that the only way to ensure thorough collection of all waste was to appoint an individual with the specific task of organising salvage. It was also considered that such an official should, if possible, have the general supervision of all waste collection—iron and steel scrap, non-ferrous metals, rubber, etc. It is to be hoped that by this time every electrical firm has taken steps in this matter, but if any are still without salvage "wardens" this will serve as a reminder. As the scale of our military operations increases the need becomes greater. This salvage business is one of the most important aspects of the war effort.

The Training Report

Raising the Status of the Craftsman

AT a well-attended conference of the technical and lay Press last week the principal points in the I.E.E. Report on the Education and Training of Engineers, which was dealt with in our last issue, were explained by the President of the Institution of Electrical Engineers (Prof. C. L. Fortescue), Mr. J. R. Beard (Chairman, Post-War Planning Committee) and Dr. A. P. M. Fleming (Chairman, Education and Training and Personnel Sub-Committee).

The President referred to the responsibility which the Institution of Electrical Engineers considered that it owed not only towards its members but also towards lower-grade younger personnel. He emphasised the importance of limiting entry to engineering in all grades to suitable candidates by the aid of panels representing wider interests than those of the employer alone and also of compulsory part-time day release for general education and vocational instruction. Evening instruction should also be provided but should not be compulsory.

Extension of Bursary Scheme

He drew especial attention to the recommendation that the State Bursary scheme should be extended to all able to profit by it, with provision for increased transfer from National Certificate to university courses. Properly trained craftsmen would be necessary in the national interest after the war to maintain the high standard of British manufacture. Their status needed to be raised since there was a tendency for young men to prefer non-manual occupations. He reminded his audience that the provision of funds was a political matter.

Mr. Beard drew attention to the importance of the provisions for " teaching the teacher," a probationary period for apprentices, the acceptance by each employer of responsibility for training them if possible in special apprentice workshops, the spending of a year between school and university in industry and the duty of the university to equip men for leadership and to furnish instruction in such subjects as economics, law and social science.

Dr. Fleming, describing the electrical professions as truly democratic, acknowledged the help afforded to the Sub-Committee through the constructive criticisms received from all classes of the I.E.E. membership of over 2,300 during the discussions on the paper he had presented last year in London and at the local Centres. He also expressed appreciation of the assistance given by Dr. Abbott of the Board of Education in informal discussions.

He urged the need to raise the status of the craftsman, whether he was to be promoted or not. Development of overseas trade would depend upon quality of workmanship, but there were no standards in this country except those maintained by individual firms.

Sources of Supply

The annual intake of learners into engineering industries in England alone was given for 1942 as about 21,000. Of these 51 per cent. came from elementary schools, 21 per cent. from junior technical schools, 25 per cent. from secondary and public schools and 3 per cent. from universities. In 1938, out of 1¼ million students in technical industries only some 40,000 were afforded part-time day release for training. The proportion would have to be much larger. Industry was not static and innovations succeeded one another rapidly. Textbooks tended to get out of date quickly and the technical Press rendered essential service in providing up-to-date information.

Dr. Fleming also entered a plea for the extension of the State Bursary scheme. Not only the brilliant student should be catered for; others should be enabled to pursue courses of study most suited to them. Technical and general education were closely inter-related and could not be kept in water-tight compartments. He had found that small special courses, *e.g.*, in oscillograph work in its industrial application, served a most useful purpose. Since engineering was the base of all material progress and depended so much on personnel, it was a matter of national concern that the best teachers should be available. The ultimate test in all cases was whether each individual carried out his job most efficiently. Although the percentage of craftsmen to the whole body of workers might be less than it had been, their total was now very much greater and the need for greater numbers would continue to grow.

Alloy Castings

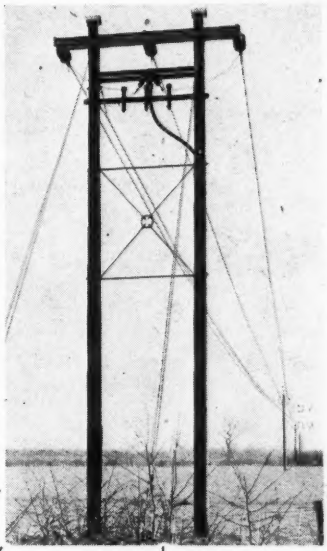
AN illustrated booklet of 27 pages which has been compiled by Kent Alloys, Ltd., Commercial Road, Strood, Kent, conveys a clear idea of the extent to which scientific research and laboratory control of metallurgical processes are now employed. The middle portion of the publication describes examples of die-cast, both pressure and gravity, as well as sand-cast aircraft components of various sorts. The third section of the booklet contains reference charts (analytical requirements) for both aluminium and bronze casting alloys, followed by specification data.

Rural Distribution

Reinforcement of an 11-kV Overhead System

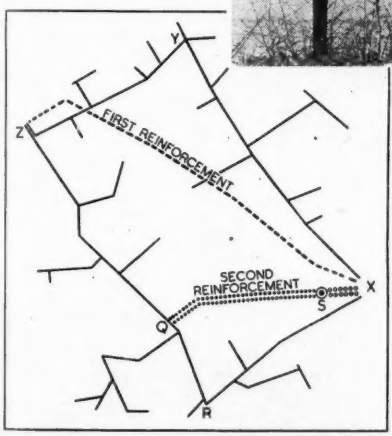
THE accompanying sketch represents diagrammatically a section of an 11-kV overhead rural distribution system which became overloaded partly as a result of the trend before the war towards setting up industries in rural areas, but mainly because of wartime increases in the population and additional demands on the public electricity supply for war establishments. In consequence, the system has been reinforced in two stages.

The points Y, Z and R are key junctions on the original ring main served from the main distribution centre at X. In the first place normal industrial developments resulted in a load concentration in the vicinity of Z, so the first reinforcing line XZ was built to meet this concentration and to back up the distribution in the area generally. Later, the load increased rapidly throughout the area ZQR and a second reinforcement became necessary. This is represented by a line XQ which has very recently been completed and put into service; it is about this that we are mainly concerned in the article.



The first reinforcement is a single-pole line with H structures at the termini and sharp angles

The first reinforcing line is nine miles long and it is actually designed and constructed for 33-kV three-phase working, in anticipation of future developments, although it is now in operation at the system pressure of 11 kV. It is a single-pole line employing Norwegian red-fir poles which the undertaking had secured earlier to meet emergencies. The poles are 13 in. in diameter and 40 ft. long and they are planted 7 ft. deep. They carry V-type pole-top brackets with 4 in. by 2 in. channels to carry two of the conductors, the third conductor being carried on the top of the poles. The spacing between the conductors is 5 ft. and the average line span is 360 ft. The conductors are of 7/·136 copper and they are supported on 33-kV pin-type insulators. Below the power conductors the line carries a 7/12 galvanised-steel earth wire. The terminal poles, section poles, and a few sharp-angle poles on the route are of H-construction. This line was erected by Pirelli-General Cable Works, Ltd.



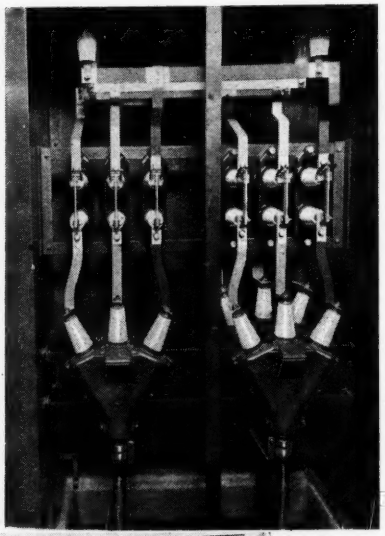
As a result of overload the 11-kV overhead rural distribution system has been reinforced in two stages

The second reinforcement is a dual-circuit 11-kV line which has virtually split the original ring main, but it has added considerably to the flexibility of the system switching as we shall see later. The first 1¼ miles from the main distribution centre is through an urban district and so this section comprises underground cable. The actual overhead-line part is 3½ miles long. At the junction of the underground and overhead portions is a new substation which, in addition to providing a switching section for

the line, also serves as a local distribution centre.

Two 0·1 sq. in. cables are in use between the main distribution centre and the new substation, but they do not function separately as circuits in conjunction with the separate overhead-line circuits. Indeed, they are normally run in parallel and the reason for the scheme is partly economic, in that the carrying capacity of two 0·1-sq. in. cables is greater than that of one 0·2-sq. in. cable, and partly on account of the greater flexibility of supply and safety factor afforded by two cables.

At the main distribution centre one of the feeder circuit-breakers is solid-coupled through a 0·25-sq. in. cable to a set of short bus-bars from which the two 0·1 sq. in. underground cables are served *via* isolating links. The three cable trifurcating boxes, the isolating links and the bus-bars are all compactly arranged with adequate spacing in a steel cubicle.

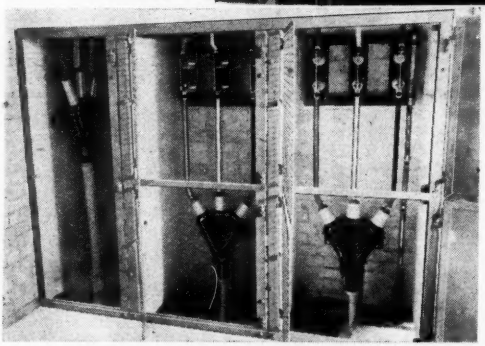


At the distribution centre one feeder circuit-breaker is solid coupled to a set of short bus-bars from which the two 0·1 sq. in. cables are served *via* isolating links

In the substation at the underground and overhead junction is a brick inner chamber sub-divided so as to form three adjacent cubicles which are all served by a set of bus-bars. In two of the cubicles—centre and right—the two cables from the main distribution centre terminate and are connected with the bus-bars *via* isolating links, so that normally they are in parallel as they are at the distribution centre end. In the third cubicle the bus-bars are connected solid to a cable serving bus-bars of an e.h.v. distribution switchboard in the main substation room.

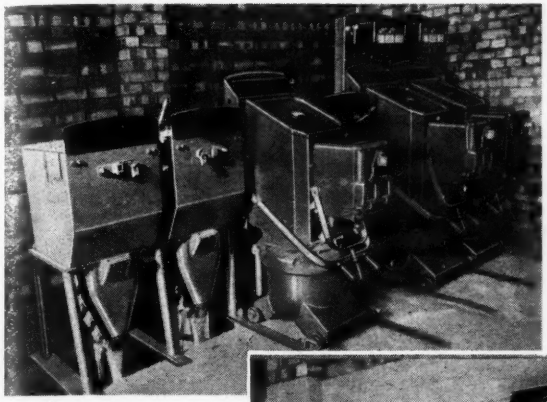
The switchboard is a " Metrovick " K.O.B. type ironclad equipment of welded construction, accommodating air-insulated bus-bars and six units—two circuit-breakers controlling the overhead-line circuits, a bus-bar coupler, a distribution transformer circuit-breaker and two oil-immersed, load breaking isolating-link units for local e.h.v. distribution.

The overhead-line circuit-breakers are of the horizontal draw-out type, racking-out being effected by large handles. They each have carrying and rupturing capacities of 400 A and 150 MVA, respectively. They are hand operated and are arranged for DC tripping from the distribution-centre battery. By pilot-wire control, however, the tripping gear can be put in or out of action at will at the distribution centre, and normally the tripping operation for both circuits is left to the feeder circuit-breaker at the centre. When the feeder breaker trips once, however, local tripping is immediately established and the two circuits are left under the control of their respective circuit-breakers at the substation until conditions are considered normal again. As the substation is normally unattended the significance of this scheme in time saving will be appreciated.



In the substation the cables terminate in two cubicles and are connected through links to bus-bars which are solid connected to the switchboard cable in the third cubicle

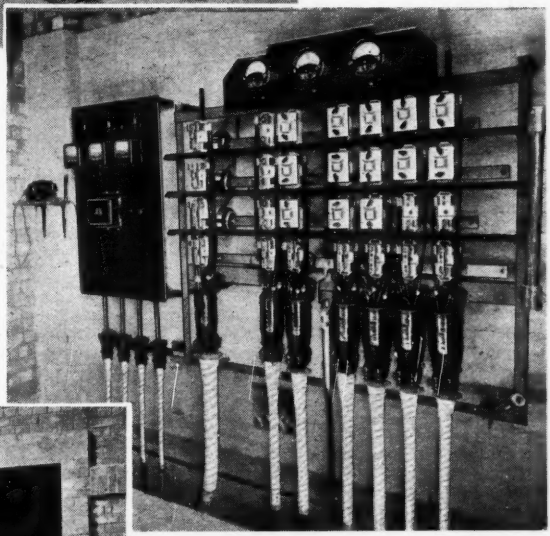
The 300-kVA Fuller transformer for local low-voltage distribution is housed in a separate chamber of the substation which is " open " on opposite sides, being guarded by lattice sliding gates. This semi-outdoor

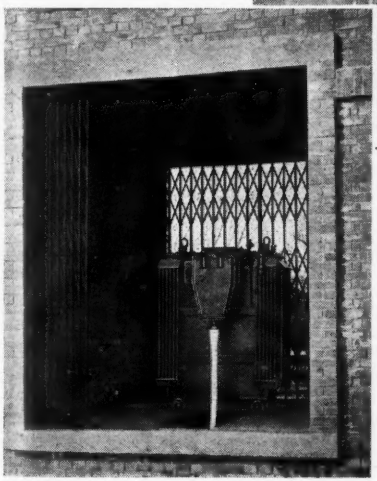


The substation 11-kV switchboard is of welded construction with air-insulated bus-bars

scheme offers the advantages of both outdoor cooling and cover. Henley vertical pillar-type units are employed for the low-voltage distribution.

Short underground cable runs connect the two overhead-line circuit-breakers solid with the actual line circuits, there being no fusing on the substation-end terminal





Above: Vertical pillar-type units are employed for the low-voltage distribution
Left : The semi-outdoor scheme for the transformer offers the advantages of both outdoor cooling and cover

connections to these are supported on long-spindle insulators.

Except for one road-crossing break where underground cable is employed to avoid a public telephone line, the new double-circuit power line is overhead continuously from the substation. The terminal-pole structures and their equipment at this crossing are similar to those at S in the diagram, except for the absence of lightning arrestors. Otherwise the line throughout to the far terminal-pole structure at Q is of Rutter-pole construction. The pole members of all the structures, pole unit. This is a two-member structure with double cross bracings and guy anchoring. The cables are stapled one to each member and the pole-type trifurcating boxes are carried on the ends of one of the equipment channel cross members. Solid ties connect the box terminals direct to the line conductors. The main insulators are Buller double-shed strainer equipments fitted with horn gaps. Lightning arrestors are carried on the channel cross arms and the jumper

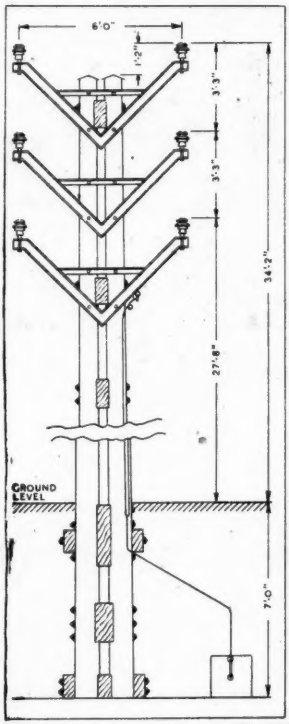
Rutter and terminals alike, are English larch and Scotch red fir, and the use of this home-grown timber is an experiment which will be watched with the greatest interest. The poles were specially selected and carefully marked to distinguish the larch from the fir for record purposes, and observations will be made on the lasting qualities of the two kinds of timber.

Each Rutter member is 40 ft. long and 9½ in. in diameter at a point 5 ft. from the butt. The structures are planted to a depth of 7 ft. and there are six 12-in. by 12-in. oak bracing blocks above ground and three below ground. There are four foundation blocks, two at the top measuring 10 in. by 5 in. by 10 ft. long, and two at the bottom of similar section but 4 ft. 6 in. long.

Because of the relatively recent introduction of the Rutter pole we feel that the following comparison of the strengths of Rutter, A and H poles is relevant, but we must emphasise that the values are theoretical ones, representing the net safe loads, excluding wind pressures, for Norwegian red fir structures 33 ft. long above ground and 9½ in. diameter: Rutter, 3,242 lb., A, 2,120 lb. and H, 1,338 lb.

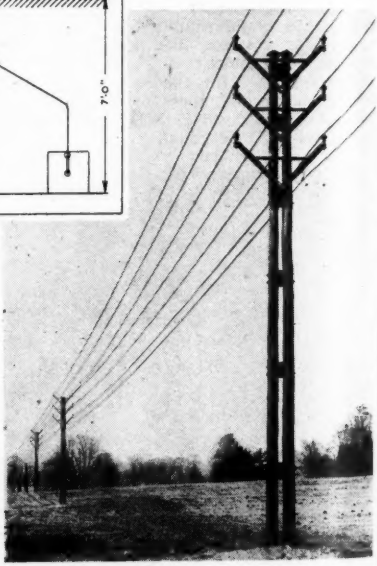
The line is liberally designed with a generous factor of safety on the transverse and longitudinal loadings of the poles, and the 6 ft. spacings between the conductors will allow for conversion to 33-kV working if required at some future date. The conductor supports are 4 in. by 2 in. mild-steel welded channel V arms, this construction being adopted as a precaution against bird troubles. The V members are braced about mid-way up the V, and both the V and the brace are bolted to both members of the structure, each V member to one pole member. Horizontal extensions at the ends of the V supports carry Buller 22-kV pin-type insulators. The conductors are 0·1-sq. in., stranded (7/·136) hard-drawn bare-copper cables. The average span for the line is 300 ft. and the maximum span is 360 ft. The line carries a continuous earth wire of 7/12 galvanised mild steel at the bottom centre.

The line terminates at Q on a four-member structure employing 40-ft. long and 11¼-in. diameter poles with double cross bracings on all sides. Cross channel members carry the equipment at the top. Guy anchoring is also provided on the far side of the structure.



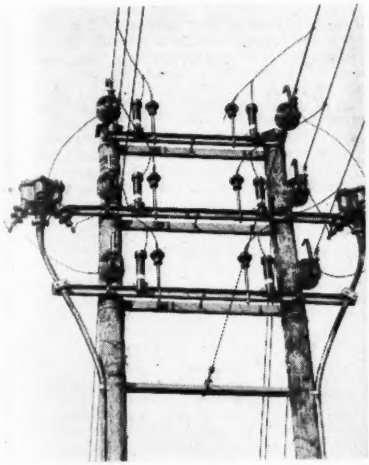
As we have already indicated, the ring-main XYZRX has been split at Q for normal working as the result of this second system reinforcement, and so line RZ has also been "made-off" on either side to the four-member structure at Q. Strainer insulators complete with horn gaps and similar to those on the H terminal structure are used for all the conductors on the new and old ring-main lines. On the new line lightning protection similar to that at the other end of the line is provided.

Vertical switches on the new-line face of the structure each connect with one of the new circuits and one leg of the old ring main, and as these switches are normally closed the system now operates as two ring

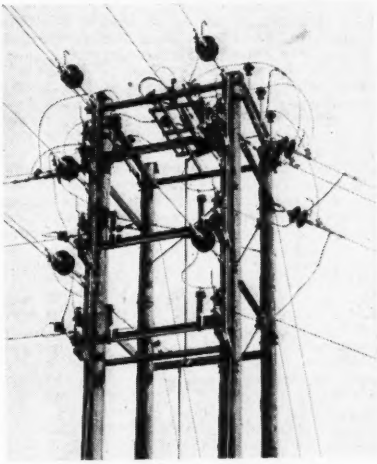


The second reinforcement line is of Rutter-pole construction. It is liberally designed and the spacings will allow for conversion to 33 kV

mains XRQX and XYZQX. On top of the structure is mounted a horizontal switch which connects with both sections of the old ring main, and this switch is normally left open.



The substation-end terminal pole unit is a two-member structure with double cross bracings and guy anchoring



The line is terminated on a four-member structure with switching arrangements for an excellent interconnection scheme

The complete switching assembly provides an excellent interconnection scheme for both maintenance and load-adjustment purposes, for it will be seen that by various switching arrangements other than the normal operation the two new circuits can be run in parallel, either of the new circuits can be a single back-up feed on to the old ring, or the old ring can be operated " as you were," independently of the new line. All the switches are operated remotely from near the ground level, the switch handles being secured with pins and padlocks. The contract was carried out by Johnson & Phillips, Ltd., to the specification and design of the electrical engineer and manager of the supply undertaking.

I.E.E. Committees and Awards

THE four Section Committees of the Institution of Electrical Engineers have nominated the following chairmen and vice-chairmen for 1943-44:—*Installations Section*:—Chairman: Mr. A. G. Ramsey, O.B.E., B.Sc. (Eng.) (Ministry of Works). Vice-chairman: Mr. G. O. Watson (Lloyd's Registry of Shipping). *Measurements Section.*—Chairman: Mr. E. W. Moss (Raworth, Moss & Cook). Vice-chairman: Mr. W. G. Radley, Ph.D. (Eng.) (Post Office Research Station). *Transmission Section.*—Chairman: Mr. T. R. Scott, B.Sc. (Standard Telephones & Cables, Ltd.). Vice-chairman: Mr. H. W. Grimmitt (Electricity Commission). *Wireless Section.*—Chairman: Mr. T. E. Goldup (Mullard Wireless Service Co., Ltd.). Vice-chairman: Prof. Willis Jackson, D.Sc., D.Phil. (Manchester University).

The Council of the I.E.E. has made the following award of premiums for papers read during the 1942–43 session, or accepted for publication:

Group A.—*Institution Premium:* Messrs. C. J. Beaver and E. L. Davey, B.Sc. *Kelvin Premium:* Messrs. F. Brailsford, Ph.D., Wh.Sch., and R. G. Martindale, M.Sc. *John Hopkinson Premium:* Mr. R. A. W. Connor.

Group B.—*Non-Section Premiums:* Messrs. E. Friedlander, Dr.Ing. (*Ayrton*); C. T. Melling, M.Sc.Tech. (*Llewellyn B. Atkinson*); and J. Swaffield, B.Sc.(Eng.) (*Extra*). *Wireless Section Premiums:* Mr. R. L. Smith-Rose, D.Sc. Ph.D., and Miss A. C. Stickland, M.Sc. (*Duddell*); Messrs. G. Parr and W. Grey Walter (*Ambrose Fleming*); and Prof. Willis Jackson, D.Sc., D.Phil. (*Extra*). *Measurements Section Premiums* Lt.-Col. K. Edgcumbe, T.D.(*Silvanus Thompson*); Messrs. M. Kaufmann and W. Szwander (*Mather*); and Messrs. G. H. Barker and A. L. Hancock, B.Sc. (*Extra*). *Transmission Section Premiums:* Messrs. A. W. Thompson and J. C. Wood-Mallock (*Sebastian de Ferranti*); Mr. A. A. Pollitt, M.Sc. (*John Snell*); and Messrs. H. Willott Taylor and K. L. May (*Extra*). *Installations Section Premiums:* Messrs. G. B. Alvey and N. Tetlow (*Crompton*); Messrs. Forbes, Jackson, W. J. H. Wood, G. Smith and E. Jacobi (*Swan*); and Messrs. J. R. Taylor, B.Sc. (Eng.) and C. E. Randall (*Extra*).

Group C.—*Paris Exhibition*, 1881, *Premium:* Mr. J. N. Waite.

The awards for papers read before the Students' Sections will be announced later.

NEW BOOKS

Electroplating Practice. Treatise on Receiver Design.

Electro-plating: A Survey of Modern Practice. By S. Field and A. D. Weill. Fourth edition. Pp. 437; figs. 95. Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, W.C.2. Price 15s.

The publication of this new edition, as the authors point out, is due to the rapid development in industrial electrodeposition in recent years, and to the firm establishment of new processes which, when the third edition was published five years ago, were still in the experimental stage. The new matter in the present edition includes a chapter on the testing of electrodeposits, including the test for adhesion and determination of thickness. This contains an account of the well-known jet test, now used extensively for control in many works laboratories.

The determination of hardness and porosity follow. This chapter should provide a very useful supplement to the standard data already included in the book. Other new sections include one on bright nickel plating, and on the recent developments and advances in filtration of plating solutions. The sections dealing with the analysis of individual electroplating solutions are enlarged by the addition of analytical methods for the bright nickel bath.

Every effort appears to have been made to bring the book thoroughly up to date. A glance through the pages shows that reference is constantly made to recent papers published in the *Journal* of the Electrodepositors' Society in this country, and American references include those to the *Journal* of the Electrochemical Society and the *Monthly Review* of the American Electroplaters' Society.

When one considers the numerous and varied applications of electrodeposition and allied processes of recent development, including rhodium plating for instrument work, cadmium and zinc for corrosion resistance, hard chromium for wear resistance, bright nickel, anodising of aluminium parts, and specialised applications of the older processes such as tin, copper and brass plating, not to mention the rapidly extending use of automatic plating plant, it becomes increasingly clear that it would be well-nigh impossible to keep in touch with modern developments without the aid of an up-to-date book of this type. Herein lies the justification for the new edition, which will no doubt be welcomed for this reason.—J.R.I.H.

Radio Receiver Design (Part I). By K. R. Sturley, Ph.D., B.Sc., A.M.I.E.E. Pp. 435; figs. over 160. Chapman & Hall, Ltd., 11, Henrietta Street, W.C.2. Price 28s.

There have been many textbooks on the theory of radio reception, and the construction of receivers has been described from time to time in all the technical journals, but there has been very little collected information on the theory of receiver design. It is stated in the preface that owing to war conditions the complete treatise has had to be divided into two parts, of which this volume, commencing with aerials and aerial coupling and ending with the detector stage, is the first. The second volume will start with audio-frequency amplifiers and will take us to the output of the receiver, but will include in addition a treatment of power supplies, receiver measurements, television and frequency modulated receiver design.

Throughout the volume under review every aspect of design is treated with full mathematical analysis, which is developed in detail. The author explains that he uses the cosine expression (E cos wt) for a sinusoidal voltage in place of the more common sine expression because he considers that it leads to simpler mathematical analysis.

The first volume contains eight chapters. It starts with some general considerations and then deals successively with valves, aerials and aerial coupling circuits, radio-frequency amplification, frequency changing, oscillators, intermediate frequency amplification and detection. It is exceedingly detailed, and it is difficult to think of any aspect of design which is not covered.

In certain cases there are references to subject matter which will appear in Part II, yet to be published. For instance, on looking for the treatment of automatic frequency correction, which the writer expected to find under "Oscillators" or "Intermediate frequency amplification," apart from a brief reference on page 13, this subject did not appear to be covered. However, on reading the chapter on oscillators it was learned that A.F.C. will be dealt with in Chapter 13, which is in Part II. Incidentally, the index to Part I covers the contents of this part only.

The author has included a wealth of valuable information in this volume which will be of considerable value to the advanced student and to the design engineer. It is to be hoped that the publication of Part II will not be long delayed.—W. E. M.

Basic Electricity and Magnetism. By W. C. Frid. Pp. 40; figs. 30. Sir Isaac Pitman & Sons, Ltd. Price 1s. 6d.

As this little handbook has been specially written to meet the needs of Service and "pre-Service" men who require a knowledge of the fundamental facts of electricity and magnetism, no effort has been made in the restricted space available to give explanations of the reasons for the various electrical phenomena referred to. Particular attention is paid to the applications of the subject to electrical equipment in common use, especially motor vehicle and radio apparatus.

Although in the main the treatment of the subject is accurate there are occasional lapses. As an explanation, for instance, of the use of the DC dynamo it is stated that DC is *essential* for driving trains, trams and trolley-buses and for radio work. There is also an incorrect answer to one of the test questions.—W.R.C.

Shorter Notices

High Vacuum Technique. By J. Yarwood, B.Sc.(Hons.). Pp. 106; figs. 62. Chapman & Hall, Ltd. Price 10s. 6d.

The Technique of Radio Design. By E. E. Zepler, Ph.D. Pp. 311; figs. 260. Chapman & Hall, Ltd. Price 21s.

Electric Soldering Irons

Determination of Characteristics

By H. C. Hoban, A.M.I.E.E.
(Henley Research Laboratories)

THE fundamental consideration in soldering iron design is to ensure the provision of a steady and proper temperature at the working end of the bit. The classes of work for which the iron is used will control almost completely the effectiveness with which the iron will perform its task of maintaining the proper temperature. As the classes of work are legion and generally beyond the control of the iron designer, it is necessary for the latter to devise in the laboratory suitable tests of a practical nature to ensure that the final product will satisfactorily fulfil its required functions.

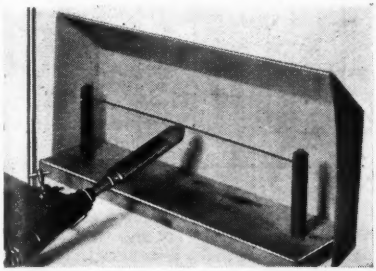


Fig. 1.—Apparatus for assessing the "work capacity" of a soldering iron

It need hardly be stated that the most satisfactory soldered joint will be made when the components are raised to a temperature sufficient to ensure that they are thoroughly "wetted" by the solder employed. Messrs. S. J. Nightingale and O. F. Hudson in their excellent book "Tin Solders" have indicated that for a given solder and flux the temperature necessary to produce a joint having maximum shear strength varies between 390 deg. C. for a joint thickness of 0·001 in. and 228 deg. C. for a joint thickness of 0·006 in. This is due to the fact that at low temperatures the solder is sluggish and will not penetrate tightly fitting joints, while at higher temperatures it is very fluid and will readily do so. These results assist the designer to adjust the working temperature of his soldering-iron bits to cover a range that appears to cater for the closed joints of the tin-box trade and the open soldered "tag" joints of the radio industry.

The term "soldering temperature" is capable of wide interpretation in so far as the temperature of the bit of a soldering iron is concerned, and can have any value between, say, the static temperature when the iron is connected to the supply mains, but is not in use, and a lower value when the bit is cooled by the work to the degree at which it will just melt the solder. It appears, therefore, that the term "working temperature" should have a value which is determined or measured while the iron is doing a fixed amount of work.

A simple apparatus developed for assessing the "work capacity" and at the same time the working temperature of the bit of a soldering iron, which I have employed for some time, is illustrated in fig. 1. The bit of the iron is held in contact with the centre of a given length of heavy gauge copper wire and the length of wire on which a standard solder is maintained in a molten condition is recorded as a measure of the work capacity of the iron, after steady temperature conditions have been reached. The temperature at the tip of the bit is determined while the iron is "free in air" and again when in contact with the test wire, the former value being referred to as the static temperature and the latter as the working temperature. The difference between these two values may be termed the temperature drop, or the temperature range.

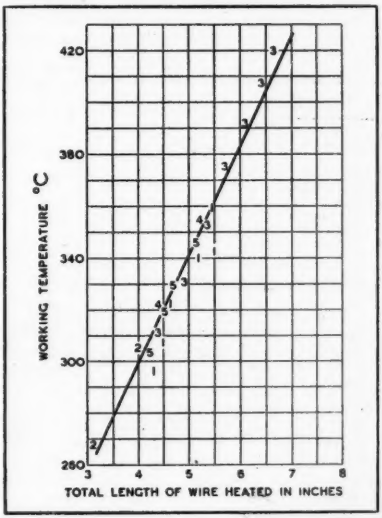


Fig. 2.—Comparison between different designs of iron

The test enables a useful comparison to be made between different designs of iron (fig. 2). Values of working temperature have been plotted against a value representing the length of wire on which solder is melted, the test being conducted on irons of varying design and with ratings from 50 to 150 W. The relationship is approximately linear, irrespective of the type of iron ; thus, the temperature of the tip of the bit, measured while the iron is in contact with the test wire, can also be taken as a measure of the work capacity of the iron. If now the working temperature and the length of wire on which solder is maintained molten is considered in conjunction with the watts consumed, some idea of the relative efficiency of various models can be determined. This is illustrated in fig. 3 for some typical modern soldering irons detailed in Table II.

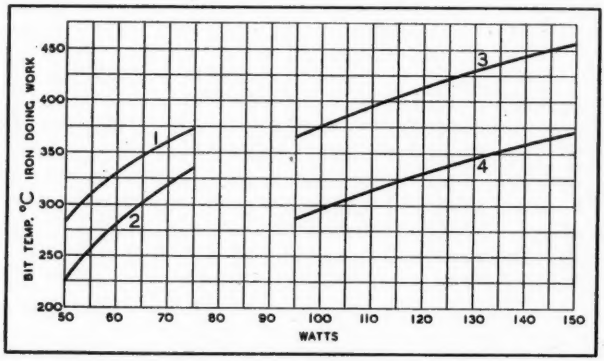


Fig. 3.—Relationship between working temperature and wattage of various models

The foregoing test data do not, however, indicate what might be termed the overall, or thermal, efficiency of the iron because the rate at which it will do certain work is not specified. It is not easy to measure, in a manner capable of practical interpretation, the thermal efficiency of an iron for the useful work done, *i.e.*, the amount of heat used in applying molten solder to a given article represents only a small fraction of the watts input to the heating element, the major part being lost in heating the work and in radiation and conduction from both the iron and the work. The following analysis, however, is suggested as a basis on which some standard of measurement could be adopted.

The rate at which an iron will melt solder is first measured by applying a stick of solder of given composition and dimensions to the tip of the bit and recording the weight melted at fixed intervals of time. The results of this observation made on six irons of different manufacture are shown graphically (fig. 4). From this it will be seen that after an interval varying from two to five minutes the irons melt the solder stick at a given steady rate. Dealing first with this steady value, it is simple to calculate the heat extracted from the iron from the known weight of solder melted, the latent and specific heats of the solder and the temperature of the molten solder leaving the bit. Experience has shown that the latter value can be adjusted to just above the liquidus temperature by controlling the rate at which the solder is fed to the bit. Table I compares the results of tests made on the six irons.

TABLE I.—THERMAL CHARACTERISTICS OF SOLDERING IRONS

Ref. No. of Iron	1	2	3	4	5	6
Solder melted/30 sec. gms. ..	14·0	12·0	30·0	17·2	22·0	10·7
" 1 " " =m.	0·467	0·4	1·0	0·574	0·734	0·357
ms $(t_2 - t_1)$	3·64	3·12	7·8	4·47	5·72	2·78
Latent heat	6.32	5·4	13·5	7·24	9·9	4·8
Total heat extracted to melt solder, cals/sec.	9·96	8·52	21·3	11·71	15·62	7·58
Heat input, cals/sec.	15·5	15·5	29·8	29·8	23·8	17·8
Efficiency (per cent.)	64·2	55·5	71·5	39·4	65·7	42·5

Latent heat of solder. 13·5 cal/gm.
Specific heat of solder (s) 0·039 cal/gm.
t_2 = 220 deg. C. liquidus of 50/50 solder.
t_1 = 20 deg. C. ambient temperature.

The efficiency figure thus obtained is obviously the maximum for the particular iron, because the heat is expended only in melting the solder and none is used in raising the temperature of the work to the required value. The heat extracted from the iron to raise the work to the correct soldering temperature will vary considerably, depending on the size of the work and the specific heat of

the metal to be soldered; it is apparent also that once the work has reached the required soldering temperature further heat will be lost by conduction from the immediate area which is being soldered. The latter loss must be only some fraction of the maximum referred to above, if efficient soldering is to be done; to determine its magnitude for one typical example reference is again made to the tests previously described, using the test wire.

The quantity of heat flowing along a bar which is heated at some point along its length can be represented approximately by the expression $Q = KA \frac{t_a - t_b}{l}$ calories per second, where K is the thermal conductivity of the material of the bar, A its cross sectional area and *l* the length between the two points on the bar where the temperature measurements are made, the higher temperature t_a being the point in contact with the soldering iron and t_b the point at which the solder just solidifies.

An expression involving emissivity of the surface of the bar has been found to give more accurate results, but for practical purposes the one given above is less complex and sufficiently accurate for the purpose.

The product KA in the expression is a constant and has a value of 0·11 for the wire used in the test previously described. The value of t_b is about 183 deg. C., which is the melting point of the eutectic of lead-tin solder, and both t_a and *l* can be obtained in the manner previously outlined. The value of *l* in the curve (fig. 2) will be halved in this calculation and the value of A doubled, for the reason that the two sections of wire on either side of the bit are, in effect, connected in parallel.

Calculated results for the six patterns of soldering iron under consideration are given in Table II.

Thus the heat lost by conduction after steady conditions have been reached is, for this particular test, a reasonably constant amount, which, however, can represent as much as 30 per cent. of the total heat extracted from the bit. Compare, for example,

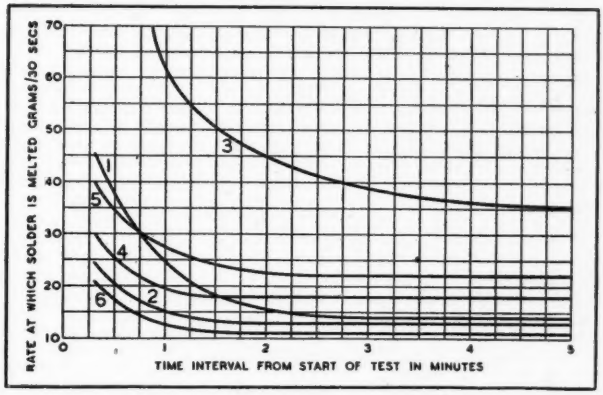


Fig. 4—Typical relative thermal characteristics

iron No. 6 in which case the heat flowing along the bar is 2·26 calories, and the heat extracted from the bit is 7·58 calories as shown in Table I.

Reverting to fig. 4, it will be observed that during the first few minutes of the time during which the iron is melting solder the rate of melting is much in excess of the steady or continuous value due to the release of the heat which has been stored in the bit of the soldering iron. The heat extracted during the initial period for which the iron is in use (after resting) will be in excess of the energy being consumed by the heating element. Thus this accumulated heat is usefully employed in heating the work during the initial stages of the soldering operation. For continuous soldering a steady supply of heat must be drawn from the element and the magnitude of this steady supply is indicated by the asymptote values shown in fig. 4 or Table I.

TABLE II.—COMPARISON OF TEST RESULTS

Ref. No.	Watts.	Type of Iron	t_a °C.	*l* cms.	$(t_a - t_b)$	Q cals. per sec.
1	65	Fixed bit	343	6·35	160	2·78
2	65	Removable pencil bit	302	5·1	119	2·57
3	125	Fixed bit	418	8·6	235	3·01
4	125	Removable pencil bit	338	6·2	155	2·75
5	100	Removable flat bit	346	6·5	163	2·76
6	75	Fixed flat bit	267	4·1	84	2·26

$K = 1 \quad A = 0.11 \quad t_b = 183$ deg. C.

Railway Electrification

Advantages Over Steam Operation

By G. O. McLean, M.Eng.

AN earlier article (January 22nd issue) stated the case for complete electrification of our railways in ten years as a post-war measure, giving details mainly from the commercial angle to substantiate the statement that electric traction is "cheaper, faster and cleaner" than steam traction. Saving of personnel and equipment, and acceleration and overload capacity were the principal points stressed.

The main technical features of the system were fixed in 1927, namely DC at 1,500 V with overhead catenary suspension and pantograph collection, though a sound financial and technical case could be put up for a change to 3,000 V, as in some of the British Dominions.

The saving of equipment possible through electrification can best be seen by comparing individual steam and electric locomotives. An analysis of steam-traction statistics (such as the Ministry of Transport pre-war annual returns) shows that the average locomotive spent less than 25 per cent. of the total hours in actual running time, while 50 per cent. was spent in the sheds, the remainder being accounted for by repairs, waiting and shunting. Considering a mileage basis, the main-line steam locomotive averages 20,000 miles per annum, whereas 60,000 is a moderate figure for its electric equivalent, and 80,000 is a feasible figure for dense-traffic conditions. Thus, if the traffic density remained constant (the Weir Committee gave 3 million ton-miles per track-mile) one-third the number of electric locomotives would be required. (A ratio of 2·3 steam to 1·0 electric was used by the Weir Committee and the author in previous articles.)

The author compares the performance of steam and electric locomotives to demonstrate the saving of equipment possible through electrification

Acceleration Factor

The attainment of higher schedule speeds for all traffic classes and consequently the saving of much idle time, especially of goods trains in sidings, mainly depends on the acceleration factor. The acceleration of any mass or its movement at a uniform velocity is a question of simple mechanics and of a knowledge of the forces of resistance. Thus the additional pull to create an acceleration of f miles per hr. per sec., after all the forces of resistance except gravity have been accounted for, is $\frac{f}{32} \times \frac{88}{60} \times 2{,}240$ lb. per ton weight.

This pull exerted by the locomotive on the train at the drawbar, or the tractive effort at the driving wheels, has to be 10 to 12 per cent. higher at the driving motor shafts due to inertia of gearing, etc. Thus acceleration of 1 MPH per sec. calls for an *additional* pull of approximately 114 lb. per ton weight.

Train resistance is a complex matter to predetermine and there have been numerous tests and researches to determine suitable empirical formulæ, containing terms of speed and surface area only, while components of drawbar pull required for overcoming gradients and flange friction at curves are often considered as items in total train resistance.

Under normal conditions train resistance is taken as 30 to 40 lb. per ton weight at starting (60 to 70 lb. in very bad weather) but only 10 to 20 lb. at moderate speeds. Thus the tractive effort for acceleration far outweighs the amount for propulsion at normal speeds. High acceleration then is a matter of applying sufficient tractive effort speedily enough with adequate weight on the driving wheels.

The steam locomotive is obviously at a great disadvantage compared with an electric locomotive. If its engine is designed for certain load conditions (weight of train, speed, steepness of gradient) it can achieve its output only if steam at design conditions can be fed into the cylinders at a certain rate. These conditions are at their worst when the engine is stationary—cylinders comparatively cold, throttle-valve shut, steam flow almost nil and fires dependent on natural draught. On the other hand, the DC series motor has the ideal torque-speed characteristic and the amount of starting current that can be drawn from the line is the limiting factor. The motor itself can momentarily develop twice its rated output. The steam locomotive to increase its output would have to increase both its boiler and engine size, and then the weight which is already high would be prohibitive, as the *total weight* of locomotive plus trailing load has to be propelled.

Coefficient of Adhesion

The electric locomotive has a power-weight ratio of 12 to 25 HP per ton, the motors having a one-hour rating. This question of the weight of the propelling engine is somewhat different with rail traction than with road or air transport, and that is why "adequate weight on driving wheels" was mentioned above. The maximum tractive

effort obtainable at the driving wheels is directly related to the weight on the wheels. The ratio, " the coefficient of adhesion," has a value between 10 and 25 per cent., depending on weather and track conditions. Owing to the rotary motion of the electric motor as opposed to the reciprocating action of the steam engine, this coefficient is higher for electric locomotives, 20 to 30 per cent. being a fair average. This slight gain explains how a 50 per cent. lighter electric locomotive can pull the same train load as a steam locomotive. It also indicates why an electric locomotive with, say, two large motors, has possibly eight or more driving wheels all coupled with side rods or through Scotch yokes. The more the weight of the locomotive can be put on the driving wheels, the greater the chance of converting electrical input into tractive effort.

The method of electrical control will, I believe, be regenerative. A speed-time curve for a suburban service with short distances between stops shows that the accelerating period is not a great deal longer than the braking period and that the energy to be dissipated in that shorter period to bring the momentum down to zero is 40 or even 50 per cent. of the total input. If this kinetic energy could be returned to the line by electrical braking it would be a very great economy.

In the discussion on Fletcher and Tustin's I.E.E. paper in 1939 (*I.E.E. Journal*, Vol. 85, No. 513), it was disclosed that energy savings up to 30 per cent. had been achieved in practice on suburban lines by the use of the Metadyne method of control. By this system the current characteristic of the series motor is changed and the limiting factor of line current at starting is removed, thus causing the peakiness associated with traction load at the supply stations to disappear. Retardation is accomplished much more smoothly, so that in addition to the saving due to energy returned to the line, a saving in the life of brake shoes and tyres would be reflected in the " outage " hours of the locomotive or motor unit and the maintenance wages bill. Technically, there are no unsolved problems to hinder complete electrification immediately after the war, though naturally there are likely to be many improvements as experience increases.

Motor Standardisation

The Relationship of Dimensions to Output

IN last week's *Electrical Review* Mr. H. Marryat's, I.E.E. paper on the standardisation of motors was summarised. The discussion at the Institution on May 13th was opened by Mr. D. B. Hoseason (Brush Electrical Engineering Co.), who said that he was in favour of standardising motor dimensions for the reasons given by the author, but he hoped that horse-power would not be tied up with physical dimensions. He knew of motors which had been built and tested having dimensions and weight some 35 per cent. less than the present-day market standards. They conformed to the B.S.S., with regard to temperature rise, overload capacity, etc., but their efficiency was somewhat lower than the present-day market level. If in the future power became cheaper the lower efficiency was not likely to be the same disadvantage that it was to-day.

Dr. R. J. Jakeman (G.E.C.) did not agree with many points in the paper nor with what Mr. Hoseason had said; unless dimensions were correlated with output there could be no real standardisation. The electric drive was so well established that the standardisation of motors would have no effect upon the demand, and he did not believe that standardisation would reduce manufacturing costs because already manufacturers made their own standard products in large quantities. Motors should be interchangeable as a whole, but the interchangeability of individual parts should not be considered as it was much too difficult. There were developments to be looked for in the use of glass insulation and other new materials which were coming along; therefore, he could not agree that standardisation would really benefit very many people.

Dr. J. W. McFarlane (McFarlane Engineering Co.) agreed with Dr. Jakeman and said he disagreed with the author entirely when he suggested that finality had been reached in design within the range quoted in the paper. In view of the new materials mentioned, to standardise on the lines suggested would seriously hamper the possibilities of development after the war.

Mr. H. W. Bosworth (Lancashire Dynamo & Crypto) contended that finality in design of these motors had by no means been reached. American manufacturers bitterly regretted that output had been tied up with dimensions ; any such attempt here would slow down development and be a definite handicap to the manufacturer and to trade. Another point was that British motors at home and abroad had a very high reputation for performance and he could not think of anything that would be more welcomed by the Japanese and Italian manufacturers, for instance, than to be told in the future that all British motors would be of certain definite

sizes. The result would be a cheap competitor with a guarantee that it would take the place of any motor that might come from this country. Something of the same sort might also happen in this country, and cheap and inferior motors would be placed on the market. The effect would be that the large manufacturers would combine to make standard motors in large quantities which would create a monopoly and this would be followed by a demand for nationalisation of the manufacture of electrical machinery. We should maintain one of our outstanding qualities—our willingness to meet buyers' specifications and not to be lured away by mass production and standardisation.

Mr. F. Harrabin (Higgs Motors) remarked that the author had set out an ideal and it was remarkable and regrettable that the case now made out in the paper had not been presented and settled before this. When one looked at what the N.E.M.A. had done, we must realise how far behind America we were in this matter. Undoubtedly, however, there were difficulties in standardisation so far as manufacture was concerned. One fundamental quality was the number of frame diameters and another was the diameter of the shaft, which was linked with the tensile quality of the steel employed. Would the author limit the weight of the machine? All these matters varied between different manufacturers and any agreement seemed hardly possible. He could not agree that design had almost reached finality and to tie dimensions to output would certainly reduce incentive. A three-year policy was entirely inadequate for such a change.

Mr. H. H. Spencer (Crompton Parkinson) said that he saw no evidence of a demand from consumers for standardisation. The disadvantages of what the author proposed would far outweigh any advantages and would not permit manufacturers to give their accustomed service to users.

The Agricultural User

Mr. R. Borlase Matthews expressed the view that standardisation was very important from the user's point of view and especially as regarded mechanical dimensions. The author's suggestions did not cover one very large user, the agriculturist. There were over 200,000 electric motors at present in use on farms in this country and that number could be expected to go beyond the million mark in the future. For this class of user it was necessary to have the starting and protective apparatus on the motor and any consideration of standardisation should make provision for that.

Mr. J. H. R. Nixon (Brush Co.) thought the author, in restricting his proposals, had laid the foundation of something which would be very useful in the future. It was necessary to take a world view of this matter and to link up with American practice and, indeed, with that of the manufacturers of other countries. If there were a world standard, markets would be open to us which would otherwise be closed. We must get the maximum HP per lb. of material and that must be linked up with dimensions and reliability and standards of performance.

Mr. P. Good (British Standards Institution) congratulated the author on showing that this subject justified an objective study. The electric motor would have an enormous use in the future and in most cases would be an almost insignificant part of the appliance to which it was attached as regarded size and even cost. Therefore, he was sorry the author had not taken his size range below 1 HP. In the future in very small sizes we must think of replacing a motor as we now replaced a lamp, and he did not believe that that time was far away.

Special Requirements

Mr. H. Jack (Ferranti, Ltd.) said he had always been advised by American engineers against following their lead in the matter of standardisation of motors as they found it affected output to a considerable extent. Each industry seemed to require a motor developed more or less for its own requirements, and it was no use standardising where there was only a small field. Each large user required a motor to meet his own requirements and that had been the tendency in British motor manufacture. The output from a given quantity of material had been trebled in 30 years and he would not say that the limit had yet been reached.

Mr. E. T. Norris (Ferranti, Ltd.) said the main use of standardisation was to make replacement more easy. In his view it was emphatically to the interest of the manufacturer and the user that designs should be restricted. Certain dimensions could be fixed which would not lead to the objection that dimensions were tied up with output and a wide range of ratings would be possible.

Mr. E. H. Miller (Sangamo Weston Co.) remarked that while a motor should be replaceable by another the interior should be left alone.

The author in his reply maintained that to a large extent finality of design had been reached with the ordinary motor which was sold "off the shelf." The view in the paper was that each manufacturer should be allowed to obtain as much power as he could from his machine; in other words he agreed that output should not be tied up with dimensions. There need be no fear of competition from cheaper non-standard machines if British makers so improved performance over the limited range that it would be difficult for such competition to exist and he claimed that this could be achieved by united action.

PERSONAL and SOCIAL

News of Men and Women of the Industry

ST. Andrew's University Court has appointed **Mr. G. D. Preston,** M.A., senior scientific officer, National Physical Laboratory, to the vacant Harris Chair of Physics in University College, Dundee. Mr. Preston is particularly interested in the study of metals and alloys by the method of X-ray diffraction, on which subject he is an authority. More recently he has taken part in the development of the electron microscope and in the study of electron optics for obtaining images at very high magnifications.

The University of Bristol is inviting applications for the chair of electrical engineering which was held for thirty-eight years by Dr. David Robertson, who died in January, 1941. Since that date the department has been run in conjunction with King's College, which is now returning to London. It is stated that applications from persons engaged in work of national importance for the duration of the war will be considered. The closing date is June 1st and particulars may be obtained from the secretary and registrar.

Mr. T. H. Carr, whose appointment as city electrical engineer and manager at Bradford has now been confirmed by the Council, accedes to the position of " chief " of this important undertaking at the early age of thirty-seven. He has risen rapidly in his profession, and since the beginning of the war has successively held the positions of technical assistant to the borough electrical engineer and then power station superintendent at Derby and (since July, 1941) deputy at Bradford. Previously he had held appointments with Vickers-Armstrongs, A. Reyrolle & Co., Ltd., Merz & McLellan, the North-Eastern Electric Supply Co., Ltd., the National Boiler & General Insurance Co., Ltd., and Sheffield Corporation Electricity Department (assistant construction engineer).

Mr. T. H. Carr

Mr. Carr received his technical training at John Spencer & Sons Works' School, Atkinson Road Junior Technical School and Rutherford Technical College, Newcastle-on-Tyne, and served his apprenticeship with John Spencer & Sons, Ltd., and Sir W. G. Armstrong, Whitworth & Co., Ltd.

Mr. Carr is the author of a two-volume treatise on " Electric Power Stations," with a foreword by Sir Leonard Pearce, which is now in its second edition, and he has written pamphlets on power station equipment published by the Draughtsman Publishing Co. A number of contributions from his pen have appeared in the *Electrical Review,* the most recent being an article proposing the formation of a Generation Section of the I.E.E. which aroused considerable interest.

Besides being an associate member of the Institutions of Civil and Electrical Engineers Mr. Carr is a member of the Institution of Mechanical Engineers, the Association of Mining Electrical and Mechanical Engineers and the Institute of Fuel.

The London Students' Section of the Institution of Electrical Engineers held a successful dance at the Lysbeth Hall, Soho Square, on May 1st. This was the first of their dances to be held in the evening since the " blitz," and the large attendance of about 120 members and friends showed that evening dances are preferred. Among the visitors was the President of the Institution, **Professor C. L. Fortescue,** O.B.E., M.A., who, towards the end of the evening, made a short speech in which he referred particularly to the vital war work women were doing in the electrical industry.

A report was submitted to Walsall Town Council recently on the salary of the electrical engineer and manager, **Mr. E. A. Newburn,** and it was agreed to receive a representative of the Associated Municipal Electrical Engineers on the matter.

Mr. H. D. Lloyd, managing director of Electrical Engineering Supplies (Birmingham), Ltd., informs us that he is terminating his engagement with the company on June 30th, in order to engage more actively in the war effort.

Mr. R. McLeod, transport manager, Edinburgh Corporation, was elected president for 1943-44 at the annual general meeting of the Scottish Road Passenger Transport Association held at Aberdeen on May 4th. **Councillor W. Collins,** convener of the Aberdeen Corporation Transport Committee, was elected vice-president of the Association.

Sir Alexander Aikman has been appointed deputy chairman of Electric & Musical Industries, Ltd.

Mr. A. C. Henry, vice-president of Montreal Light, Heat and Power Consolidated, has been appointed president of the newly-created Defence Communications, Ltd., a Crown company formed to co-ordinate " certain telegraph, telephone and other communications systems in Canada on behalf of the armed forces, and to provide additional equipment for such systems."

Obituary

Lt.-Col. W. G. T. Pope.—The death occurred at the British Hospital, Lisbon, on May 15th, of Lt.-Col. William G. T. Pope, O.B.E., M.C., M.I.E.E., late R.E., who for twenty years was general manager of the Anglo-Portuguese Telephone Co., Ltd., in Portugal. He retired two or three years ago. Col. Pope, who was a nephew of the late Lord Baden-Powell, was sixty-three years of age.

Mrs. E. Russell.—We regret to record the death of Mrs. Edith Russell, widow of Dr. Alexander Russell, F.R.S., which occurred on May 8th at Mill Hill, at the age of eighty. Our readers will recall that Dr. Russell died in January last.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Information on Supply Problems

I WOULD like to support the plea made by Mr. Eccles in your issue of May 14th for a central clearing house to which details of all plant breakdowns (generation and distribution) should be sent. I made a similar plea during the discussion on the Transmission Section symposium of papers dealing with the protection of undertakings at the I.E.E. in London on May 12th, and I have had a considerable amount of written and verbal support.

It seems to me incredible in these days that probably half of the 600 or so separate supply undertakings with a large number of power stations should deal with their problems behind closed doors, usually, as Mr. Eccles remarks, passing over the same ground in parallel. The Central Electricity Board has made an approach to the problem in a scientific way by instituting regular meetings of power station superintendents, but more collaboration and scientific data are still required.

Probably the Electrical Research Association would be prepared to act as a circularising and co-ordinating body in this matter if it felt that it would receive reasonable support from the supply undertakings.

Norwich. J. A. SUMNER,
City Electrical Engineer.

MR. ECCLES, I am glad to see, has joined in making a plea for a central clearing house where the full facts of each breakdown on electricity supply systems could be made generally accessible.

Mr. Allwood and I in our paper presented to the I.E.E. Transmission Section last week advocated that the provision of returns relating to high-voltage faults should be obligatory so that some technical body could undertake their correlation and make the resulting information available to the supply industry in general. This suggestion was well supported by the speakers in the discussion and there is increasing evidence that the time has arrived when supply undertakings and manufacturers alike are not only willing but anxious to submit their experiences and troubles to an independent body for the common good.

The first step towards this end would be for the I.M.E.A., in collaboration with the company undertakings' organisations, to adopt a form for reporting such occurrences and to recommend their members to forward such reports to a central body to be appointed or selected for the purpose. Alternatively the Electricity Commissioners might be asked to impose a regulation to that effect so extending the scope of the existing Electricity Supply Regulation No. 38. Possibly the best body to select for undertaking the work of correlation would be the E.R.A., and it will be remembered that it has already carried out some similar work in reporting on the operation of discriminative protective systems.

Cheltenham. R. W. STEEL,
Borough Electrical Engineer.

Rewinding Armatures

REFERRING to Mr. G. R. Ford's letter in the current issue of the *Electrical Review* I am quite in agreement with his contention but there is every excuse for electrical men in allied branches of the trade attempting to do such work.

For instance, some months ago I had occasion to ask the makers of a vacuum cleaner to rewind the motor and overhaul the machine. They accepted the order and asked for delivery together with the cash in advance, an amount of £2 odd. After they had had the cleaner for about two months I was informed that owing to trade conditions brought about by the Services' demands the makers were quite uncertain when the repair would be done.

They offered to return the cleaner, otherwise it would remain with them at my responsibility. As I agree with Mr. Ford you can imagine my predicament.

Wimbledon. A. COULDWELL.

I QUITE appreciate Mr. G. R. Ford's comments with regard to my article in your issue of 23rd April. I would point out, however, that my reference was to ". . . electricians who are in a position to undertake the rewinding themselves," and was intended to apply to those who are in a position by dint of some previous winding experience. Many electricians have had this experience and are capable of undertaking the rewinding of these small armatures.

I suggest, therefore, that in order to avoid delay, some could *not* be more usefully employed than in making use of this former experience by rewinding and putting into service again in a few hours a unit that might otherwise be out of commission for a considerable time. Some companies employ a winder to undertake the rewinding and repair of very urgent breakdowns. Their work consists mainly of the repair of larger machines and I know of several experienced men who have found trouble in arriving at the correct

formula for the winding of these very small armatures—hence the reason for the article.
Cambridge. R. NEWING.

I.E.E. Graduates

THE serious complaint made by the "Seven I.E.E. Graduates" of Bath in your issue of May 7th, could surely be rectified by the Ministry of Labour and National Service which is empowered under Defence Regulation 58A to direct any worker to go to any particular employment.

The officials concerned often appear to be far too timorous to discharge their executive duties if, indeed, they are not quite outside their abilities and experience—hence, the advocacy of a Central Scientific and Technical Board, "to co-ordinate research and developments in relation to the war effort and to ensure that the experience, knowledge and creative genius of British technicians and scientists exert more effective influence over the conduct of a highly mechanised war."

At all costs we should have a Central Technical Board in this "engineers' war" to ensure speedy victory. "MISUSED."

Industrial Fuel Economy

Successful Two-Day Conference

THE growing appreciation of the importance to the war effort of saving fuel was demonstrated last week by a successful two-day conference on industrial fuel economy held at the Institution of Civil Engineers. The conference, organised by the Fuel Efficiency Committee of the Ministry of Fuel and Power under the chairmanship of Dr. E. S. Grumell, was attended by nearly 800 representatives of industrial establishments from all over the country—almost four times as many as were present at the Committee's first conference held six months ago.

Opening the conference, Major Gwilym Lloyd George, Minister of Fuel and Power, said it was because he realised that the biggest savings could be made by industry that he was making this special appeal for even better results. The contribution they could make might be decisive. Waste was sometimes due to inefficiency of plant which engineers alone could remedy, but there was also waste which could be remedied by management.

Analysis of Faults

Outlining the regional organisation of the fuel efficiency campaign, Sir John Dalton (London Regional Fuel and Power Controller) said that, to date, the efforts of the Regions had resulted in a rate of saving approximating to one million tons of coal a year. The London Fuel Efficiency Committee had found that, in 25 per cent. of the cases, the recommendations of its visiting engineers concerned the lagging of exposed surfaces. Some 12 per cent. of the cases concerned the collection and return of condensate; another 12 per cent. comprised advice given regarding bad stoking and mal-adjustment of dampers; some 10 per cent. were concerned with the repair or renewal of brickwork and another 10 per cent. with feed-water treatment.

Describing the methods adopted by the electricity supply industry to promote the efficient use of fuel, Sir Johnstone Wright (chief engineer, Central Electricity Board) said that it seemed to require a war to make us appreciate the value of our greatest national asset, coal. Fortunately the electricity supply industry had learnt a great deal during the last war and very much had been done to increase the overall efficiency. Coal was the essential raw material of electricity supply and it accounted for more than half the total generation costs. Besides this spur of commercial considerations, progress had been facilitated by the rapid growth in output which had enabled continually larger units to be installed.

Where Improvements Have Been Made

Improvements could be traced to three general causes—technical developments in the plant itself, measurement and publicity of results and improvements in co-ordination of electricity supply. As regards the plant, there had been steady developments in the steam turbine, and a big step forward was taken by the diversion of steam at different parts of the expansion for the purpose of heating feed-water. On the boiler side there had been all-round improvements including the specialised design of boilers to deal with particular types of coal.

The records initiated during the last war by the Coal Controller and carried on by the Electricity Commissioners had furnished precise statistics on which to base the evaluation of station efficiency. The competitive spirit among power engineers had been stimulated by the publication of these results and undertakings had taken a professional pride in endeavouring to reach a high place in the order of these statistics. In the search for the highest possible efficiency associated with the steam cycle existing at a particular station, there had been a relentless tracking

down of the sources of any avoidable losses at every stage of the conversion of heat into electricity.

A final step in the economical use of fuel was taken when the generation of electricity was co-ordinated under the Central Electricity Board in 1927. By the interconnection of generating stations, the grid had enabled fuller use to be made of the more economical plant. During off-peak hours, generation by the less economical plant was severely restricted and the load concentrated on the most economical units.

The overall results were shown by the fact that between 1931 and 1939 the number of B.Th.U. required to produce one kWh of electricity fell from 39,000 to 17,000. The weight of coal per kWh fell from 3½ to 1½ lb. in eighteen years. But for this improvement the coal consumption in 1942 would have been 50 million tons instead of the present consumption of 22 millions. During the war changes in coal quality and especially unexpected variations at first produced a slight worsening of the position, but this process had now been arrested and improvement had again been registered.

On the use of power Mr. J. H. Hurst (Deputy Director of Aircraft Production Factories, Ministry of Aircraft Production) drew attention to the saving of fuel that could be effected in connection with salt baths, while Mr. D. Newton Booth (chief mechanical engineer at a Royal Ordnance Factory) spoke of the reduction of load brought about by arranging for the maximum practicable admission of daylight, the use of light-coloured paints and distempers, reduction of individual lamp wattage, and the use of fluorescent lighting, the re-arranging of switching to give control of smaller groups of lights, the concentration of plant, cutting out shafting where possible and changing motors where of greater power than was actually required. Distribution losses had been reduced by reswitching circuits at light loads so as to use the smallest number of transformers.

Mr. J. L. Sweeton (British Drug Houses, Ltd.) had found that a portable recording ammeter had given valuable information as to the distribution of loads. In some cases large driving units had been kept running to supply only small loads, and the recording ammeter had indicated where by suitable sectionalising considerable savings could be effected.

Referring to the wasteful use of compressed air in industrial establishments, Mr. F. Longdale (G.E.C.) said that, in the works with which he was associated, a saving of 20 per cent. in electrical energy was obtained by the re-arrangement of receivers, the reduction of leakages and the introduction of isolating valves.

During the course of the conference a film intended to assist in the training of boiler house operatives was shown.

Gas-Electric "Co-ordination"

SPEAKING at the Fuel Luncheon Club on May 13th, Major Lloyd George referred to the necessity for co-ordinating the nation's fuel resources. Freedom of choice in the sort of heating which the individual consumer might require was, in favourable circumstances, an admirable thing. But the application of the principle of freedom of choice in remote areas might well mean an increase in prices locally.

Both gas and electricity were vital to this country. We could not contemplate doing without the valuable by-products of the gas industry or the quick convenience of electric light. These, however, were the extremes about which there could be little dispute. In between them lay a large field in which the relative importance of the two industries varied greatly. The benefits they conferred must not be prejudiced either in cost or in extent by an unnecessary struggle for mastery in that intermediate zone.

Referring to the expenditure on publicity of the electricity and gas industries before the war the speaker said he would be the last to oppose publicity, where it was educational, but much of the expenditure arose through the intensive and sometimes wasteful competition between gas and electricity, and one could only come to the conclusion that the consumer was left to pay.

He knew very well that the electricity industry was looking forward to the post-war period with great eagerness. The industry was young and expanding and was naturally impatient to continue with the electrification of the home, when some of its load was free from wartime requirements. The gas industry, too, had greatly developed its industrial load in wartime and had played a vital part in the war effort. It was, however, a much older industry than electricity and probably could not look forward to the rapid and remarkable expansion which electricity had undergone since 1920. But the gas undustry with its great carbonising processes was essential to the nation and we must take a wide view of the ultimate good when the time came for us to try to establish a balance between industry and industry.

In conclusion, Major Lloyd George said that for nearly two centuries this country had led the world in industrial progress and, although there had been grievous losses of life, property, trade and wealth, there was no reason why we should not continue to do so if we utilised our resources with courage and imagination.

Sir David Milne Watson (President of the Club), proposing a vote of thanks to Mr. Lloyd George, said that all he asked personally and for his industry was equality of opportunity for all the fuel industries and freedom of choice for the consumer.

COMMERCE and INDUSTRY

Glasgow and E.D.A. Contractors' Gift to Forces.

Land Mine Detector

IT is stated by the Polish Ministry of Information that the land mine detector employed with so much success by the Eighth Army in North Africa is the invention of two Poles. One of them is a second lieutenant and a member of the Polish Association of Electrical Engineers who commenced experiments on the subject in 1941 and was later joined by a sergeant. Together they devised the apparatus and carried out exhaustive tests to prove its reliability before taking it to the British military authorities. It was then put into immediate production and has since proved extremely valuable in view of the enemy's extensive use of minefields to cover his retreat.

Export Licensing

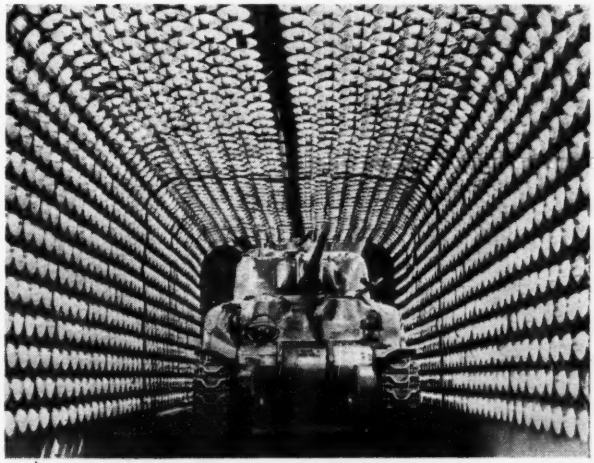
Under the Export of Goods (Control) (No. 5) Order, 1943 (S.R. & O. 1943 No. 650, price 2d.) which comes into force on May 24th, licences will be required to export, *inter alia*, the following classes of goods to all destinations :—Boilers (steam) and boiler furnaces, fuel economisers, pre-heaters, superheaters and de-superheaters, mechanical stokers, and metal parts and accessories for the foregoing; and dryers of the kinds used for drying grain, grass or other agricultural or horticultural produce and parts thereof wholly or mainly of metal. The extension, of control to industrial steam raising plant (Group 6/4) will, it should be noted, modify the existing control in respect of certain cooking and heating appliances (non-electrical) manufactured wholly or mainly of non-precious metal (Group 6/2).

Heating Apparatus Supplies

The Board of Trade announces that there will be no change in the present 15 per cent. quota of controlled goods which may be supplied during the six months from June 1st to November 30th, 1943, under the Limitation of Supplies (Heating Apparatus) (No. 2) Order, 1943. The only new feature in the text of the Order is the provision that, in future, registered persons wishing to supply controlled goods outside their quota to contractors for the execution of Government orders must obtain a written declaration, made or endorsed by their customers, that the goods are required in fulfilment of an existing contract from a Government Department; the quoting of contract numbers alone is not sufficient to justify free supply. Any person who acquires controlled goods from a registered person against such a declaration may not use them except in fulfilment of the contract quoted unless instructed by the contracting Department or specially licensed by the Board of Trade to do so. The Order (S.R. & O. 1943 No. 675), price 1d., is obtainable from the Stationery Office.

Infra-red Tank Drying

The coat of paint put on to military tanks built in the United States before they are shipped overseas is dried in four minutes, by means of infra-red rays. The machines are driven by their own power into a "tunnel" formed of some hundreds of radiant lamps, each with its individual reflector, at a U.S. Army Ordnance Department depot in the State of Pennsylvania. Ordinarily it would require twenty-four hours for a freshly painted tank to dry in air.



A newly painted American tank being dried in a "tunnel" of infra-red lamps

Glasgow Asked to Rejoin E.D.A.

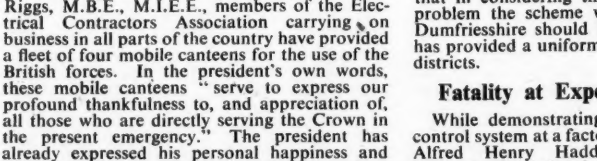
Glasgow Corporation's withdrawal from membership of E.D.A. was referred to at a recent meeting of the Electricity Committee when a resolution was moved that the manager should be asked to report on the reasons which led to the decision of the Corporation in December, 1939, and the changes which had taken place since then in the status and the work performed by the Association. To this an amendment was moved that the Corporation should take no action on the question of

resuming membership, and the amendment was carried by seven votes to six.

The subject arose out of a letter from the Scottish Centre of the I.M.E.A. which had been asked to consider the advisability of submitting evidence to the Scottish Housing Advisory Committee on the design of post-war houses. It was decided that the appropriate body to deal with the matter was the Scottish Area Committee of E.D.A. and it was suggested to Glasgow Corporation that the position of E.D.A. in this and similar matters would be greatly strengthened by having the Corporation as a member.

E.C.A. Mobile Canteens

At the suggestion of the president, Mr. Walter Riggs, M.B.E., M.I.E.E., members of the Electrical Contractors Association carrying on business in all parts of the country have provided a fleet of four mobile canteens for the use of the British forces. In the president's own words, these mobile canteens "serve to express our profound thankfulness to, and appreciation of, all those who are directly serving the Crown in the present emergency." The president has already expressed his personal happiness and pride in the support from E.C.A. members which has made this gesture possible. The mobile canteens carry the E.C.A. badge or



The fleet of mobile canteens presented to the British Forces by the E.C.A.

"sign", and it is the president's hope that they may serve to remind members of the Association and their employees now with the Services of the happy days of the past and of the still happier days to come. The presentation of this fleet was to be made in Lincoln's Inn Fields, London, on Wednesday, May 19th, 1943, by the president, to Sir Alfred Pickford, chairman of the Mobile Canteen Sub-Committee of the National Y.M.C.A. War Service Fund.

Rural Development in Scotland

A report has been presented by the Committee on the Utilisation of Land in Rural Areas of Scotland which was appointed to review the steps that were being taken in Scotland to ensure that the recommendations of the Scott Committee on Land Utilisation in Rural Areas in England and Wales (*Electrical Review*, August 28th, 1942, p. 269), in so far as they applied to Scotland were being duly considered and to advise what further steps might be taken.

The Committee considers that the Scott Committee's recommendations have all been scrutinised and that most, including all the more important and urgent of them, are now being given close and practical study. At the same time a few detailed suggestions are put forward. One relates to the Scott Committee's recommendations that electricity should be available throughout the country at no higher price to the consumer than in the town and that to secure this the Electricity Commissioners should be instructed to prepare a scheme for the reorganisation of electricity supply. The Scottish Committee recommends that in considering the Scottish aspect of this problem the scheme which is in operation in Dumfriesshire should be kept in mind since it has provided a uniform tariff in rural and urban districts.

Fatality at Experimental Foundry

While demonstrating a new electric furnace control system at a factory experimental foundry, Alfred Henry Haddock, aged thirty-five, received a fatal electric shock.

At the inquest at the Royal Bucks Hospital, Mr. C. C. Robinson, electrical engineer in charge of the electrical work at the factory, said that instructions had been given for a panel to be constructed for pyrometer and individual control of three electric furnaces. Mr. Haddock was to carry out the work under the detailed direction of Dr. G. T. Thomas, who was in charge of the experimental foundry. Witness went into the foundry to inspect the work and Mr. Haddock demonstrated how the three furnaces could be operated on one time switch by means of plugs. He had three plug tops in his hand, wired together, and he pushed these into their respective sockets on the control panel. The bottom plug had to be inserted first, and the top sockets only became alive when the plugs were inserted in them, so that any furnace could be operated at will. The demonstration was completed and Mr. Haddock pulled out the top left-hand plug with his left hand and was reaching for the top right-hand plug when Dr. Thomas came in and mentioned something about a key. It was apparently at that moment that Mr. Haddock received the shock.

In reply to the coroner, Mr. Robinson said that the only explanation he could give was that deceased must have touched one of the pins of the plug with his left hand and completed the circuit when he caught hold of the metal part of the other plug which was connected with the panel. Deceased was standing on a steel plate covering a duct and there was a possibility that he might have touched one of the pins and

received a shock through his body to earth. Before the accident orders had been given for a wooden board to be made to go over the duct.

In reply to a question by Mr. H. Bright, Electrical Inspector of Factories, witness said that had he been aware that the plugs were going to be used he would not have approved them. The sockets were of the protected type but for the purpose for which they were used the plugs were not suitable. They should either have been interlocking or the pins should have been guarded against any possibility of being touched.

Dr. Thomas stated that he prepared a scheme for the suggested control and put forward the idea of using the sockets and plugs, but the method of doing the job was arranged by deceased.

The coroner returned a verdict of " Death by electrocution " and added that he found that no blame could be attached to anyone.

Power Station Fatality

An inquest was held at Bristol last week on Herbert Thomas Hughes (61), an electrician, who met with a fatal accident at the Feeder Road power station.

Mr. A. Allison, assistant charge engineer, stated that deceased had been employed on the main switchboard, using a trolley ladder. In moving from one panel to another he damaged the insulating link of another panel, and was instructed by the charge engineer to rectify it. Having adjusted the link to the normal position, he appeared to be satisfied and stepped back as though to descend the ladder. In witness's opinion, Mr. Hughes, as an afterthought before descending the ladder, must have tried to see if the link fitted. This caused an explosion. Death was stated to have been caused by shock consequent upon extensive burning, and a verdict of " Accidental death " was returned.

Maintenance Electrician's Fall

An inquest was held at Walsall recently on Henry Charles John Baldwin (69), a maintenance electrician employed by Elwells, Ltd., who died from injuries received through falling from a ladder which he had climbed to move some electric wires. Evidence was given by Mr. J. L. Ashford, a director of Elwells, that after the accident the wires were examined and it was found that the insulation at one point had perished. There was also an earth wire which had fused. The end of this wire might have touched deceased's thigh. The coroner, recording a verdict that deceased died from shock and hæmorrhage as a result of a fall, said that the burns on his thigh were consistent with contact with the wires.

Linesman's Damages Claim Fails

At Manchester Assizes on May 7th, Mr. W. N. Winterbottom, an overhead linesmen, claimed damages from Manchester Corporation for injuries following electric shock. For the plaintiff it was stated that in May last year Mr. Sutton, another linesman, was handling a live wire while on the platform of a tower wagon, which was wet owing to the weather. As plaintiff was climbing the tower he received a shock and fell, sustaining a fracture of the elbow and other injuries. It was alleged that the tower wagon was an old one which had been much repaired with iron and that it provided imperfect insulation when wet. In evidence plaintiff said that he was wearing rubber boots but not rubber gloves.

For the Corporation it was contended that if plaintiff had been wearing gloves the accident would not have happened.

Mr. Justice Stable, giving judgment for the Corporation, said that though the tower wagon was not a modern one it complied with safety requirements. The men were provided with rubber gloves and boots and he did not think the Corporation could be expected to have inspectors to see that on every occasion the men carried out the regulations made for their safety.

Paper Salvage

A further call for intensified effort has been made by the Electrical Industry Waste Paper Recovery Committee, 2, Savoy Hill, W.C.2. A letter from the chairman, Mr. V. W. Dale, draws attention to the greater need for the recovery of all waste paper consequent upon the growing scale of our military activities. The appointment of " salvage wardens " is urged.

On the reverse of the letter is a list of firms and individuals who have responded to the Committee's earlier appeals. We would remind readers of the practice adopted by many of these concerns of sending the proceeds from the sale of waste paper to the Electrical Industries Benevolent Fund, thereby doing good in two directions at the same time.

Transformer Welding Sets

Constructional features and electrical characteristics of AC welding sets of single and dual operator types, which are mounted on wheels for mobility, are described in considerable technical detail with the aid of circuit diagrams and illustrations in a 12-page booklet (P.9556) prepared by the General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2. It commences with a brief outline of the principles governing arc stability and then specifies 6·25-kVA air-cooled and 12·75-kVA oil-immersed transformer sets in a way that affords useful information on their selection and operation. The dual operator models are continuously rated at 17 kVA.

Contract Price Adjustment Formulæ

The British Electrical and Allied Manufacturers' Association notifies us that the latest figures for use in its contract price adjustment formulæ are unchanged from those given in the *Electrical Review* of April 16th (p. 526).

TRADE MARK APPLICATIONS

THE following applications have been made for British trade marks. Objections may be entered within a month of May 12th:—

B. & H. (NOTTINGHAM), LTD. (design). No. 622,487, Class 9. Electrical switchgear apparatus.—B. & H. (Nottingham), Ltd., Popham Street Works, Popham Street, Nottingham.

EVERGRIP (design). No. B620,631, Class 17. Insulating tape.—Industrial Insulations, Ltd., Works Road, Letchworth, Herts.

Wartime Liabilities

Limitations of the Adjustment Act

By F. E. Sugden, A.C.I.S., Barrister-at-Law

AS the war continues electrical traders will be beset with many unforeseen difficulties, particularly as regards meeting their liabilities and enforcing their claims against delinquent debtors. Some time ago, the Board of Trade stated that many people were not taking advantage of the Liabilities (War Time Adjustment) Act, 1941, but since then adversity has become greater and as a consequence many people are being compelled to seek the relief granted by this Act and more and more people are each day interviewing the Liabilities Adjustment Officer at the local County Court asking him to set this machinery in motion on their behalf.

It will be remembered that the Liabilities (War Time Adjustment) Act was passed with the idea of preventing a trader going bankrupt if his financial position had been adversely affected by war, and also of affording relief to debtors who were suffering adversity through no fault of their own—persons who were genuinely affected by war conditions and who would be in a prosperous position but for the exigencies of the war.

Provable Debts

Unfortunately the trader has many other problems besides genuine debtors, but the Act does not protect dishonest persons who one regrets must inevitably exist. There is a safeguard in Section 3 which protects the debtor against any proceedings in reference to debts which are provable in bankruptcy and also those relating to hire-purchase agreements.

The term "provable debts" is a very wide one but the debtor can only seek protection in accordance with Section 17 if the debts are provable in bankruptcy. If one refers to Section 30 of the Bankruptcy Act, 1914, one will find that the general rule is that all debts and liabilities, present or future, certain or contingent, to which the debtor is subject at the date of the receiving order, or to which he may become subject before his discharge, are debts provable in bankruptcy.

That means to say that in accordance with the Liabilities (War Time Adjustment) Act debts which have accrued up to and including the date upon which the Protection Order is granted under the Liabilities (War Time Adjustment) Act by the local County Court Judge are debts in respect of which proceedings by the creditor must be stayed. Further, it is laid down that demands in the nature of unliquidated damages, arising otherwise than by reason of a contract, promise or breach of trust are not provable in bankruptcy.

The next point is: suppose a customer under twenty-one years of age orders some goods, more than are necessary, and tells the seller that he is over twenty-one years of age, then legally speaking he has committed fraud, and he has obtained these goods on false pretences. Or suppose he buys these goods without intending to pay for them but he pays a small deposit, that again is obtaining goods by false pretences. This is definitely not covered by the Liabilities (War Time Adjustment) Act.

Hire-Purchase Payments

Similarly, suppose, for instance, an electrical contractor has obtained goods on hire purchase, say some machinery, and he never had any intention of ultimately paying the full amount but hoped and trusted that his creditor would not be unduly harsh towards him. If the hire-purchase agreement was entered into after September 2nd, 1939, and at least one third of the instalments have not been paid then the creditor is entitled to recover the machinery in accordance with the Hire-Purchase Act, 1938.

Thus, if the debtor attempted in such circumstances to claim protection under the Courts (Emergency Powers) Act, I am confident that the Court would grant permission to obtain legal redress. If the debtor wilfully incurs debts which he never had any expectation of meeting, then, in my opinion, the Liabilities (War Time Adjustment) Act will not protect him. What the Act does is to protect genuine traders who have lost their businesses as a consequence of the war.

Speaking from professional experience, if a contract is entered into by fraud or by wilful or deliberate misrepresentations, then in that case the Liabilities (War Time Adjustment) Act will not protect the delinquent.

Battery Charger Modernisation

THREATENED obsolescence of battery chargers due to difficulty of obtaining certain kinds of thermionic valves may be averted by substituting a metal rectifier for the glass-bulb type. Such modernisation is undertaken by Runbaken Electrical Products, 71, Oxford Road, Manchester, 1. The reconditioning service offered includes the replacement of old sliding resistances by modern rotary rheostats and the provision of safety-marked ammeters, while the case can be refinished and the fittings replated.

ELECTRICITY SUPPLY

The Maidenhead Undertaking. Paisley's Post-War Plan.

Croydon.—REDUCED C.E.B. PAYMENT.—Councillor A. L. Boddington, chairman of the Electricity Committee, informed the Town Council at its last meeting that as a result of negotiation the amount claimed by the Central Electricity Board for electricity supplied during 1940 had been reduced by £2,717.

Hereford. — UNDERGROUND MAINS. — The Town Council is raising no objection to the proposals of the S.W.S. Electric Power Co. to lay underground cables.

Heston and Isleworth.—APPLICATION TO PURCHASE PLANT.—Early in the year application was made by the Council to the Electricity Commissioners for permission to purchase and install a 1,100-kW turbo-alternator. The Commissioners, however, have indicated that they are not satisfied that adequate justification has been shown for the installation, and as the object was to have the plant available by next winter the Electricity Committee reports that it has decided not to proceed with the application.

London.—OPPOSITION TO J.E.A.'s PROPOSALS.—The Southwark Borough Council has decided to join in the opposition to the unification proposals of the London and Home Counties J.E.A. and has arranged for the preparation of a considered case.

Maidenhead.—INSPECTION OF DISTRIBUTION SYSTEM.—An official inspection of the Corporation electricity undertaking's distribution system was made on Thursday last week by Mr. C. B. Thompson, engineering inspector of the Electricity Commission, accompanied by the Mayor of Maidenhead, Alderman H. H. Neve, members of the Council and Corporation officials. During the course of the visit Mr. C. A. Britton, borough electrical engineer, pointed out how a system of ring mains and duplicate feeds has been built up, utilising generally substations with a standardised capacity of 1,000 kVA.

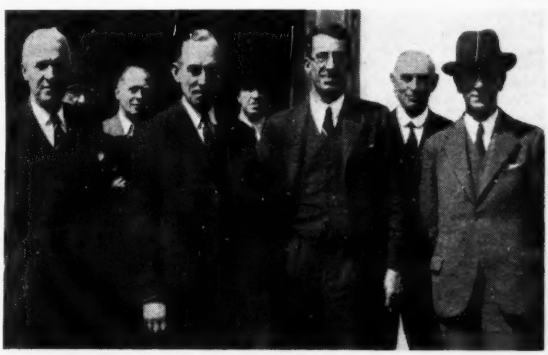
At a lunch at the Bear Hotel following the inspection Mr. Thompson read a message from Mr. H. Nimmo, chief engineering inspector of the Electricity Commission, who was prevented by illness from being present. Mr. Nimmo declared that the Maidenhead electricity undertaking was one of the most progressive in the country, and the undertaking was in a position to supply and continue to supply all industrial and domestic demands that might be made for some time to come. The undertaking formed part of the great electricity supply industry which was contributing so much to the production of every kind of war material.

Mr. Nimmo quoted a statement by the Director of War Utilities in the U.S.A. that the power man should be proud of the job that had been done in providing power supplies. Power had never been "too little or too late," and he did not know of a single instance in which the operation of a plant had been delayed by lack of electric power supply. Mr. Nimmo said that the same thing could be claimed with greater emphasis of electricity supply in this country. Even after the intensive bombing which we experienced in 1940 and 1941 there were no prolonged interruptions in the supply of electricity to any important war factories and invariably the restoration of the supply to damaged factories and other premises was always ready in time. The industry must, however, strive to give its consumers even better service in the future.

After thanking Mr. Thompson for being present, Councillor A. B. Gladwell, chairman of the Electricity Committee, complimented Mr. Britton on the efficient way he had run the undertaking since he was appointed in 1941 and also congratulated him and his staff on the way they had overcome difficulties.

Paisley.—POST-WAR SCHEME.—Mr. D. Ross, electrical engineer and manager, has prepared a report on a proposed change-over in the town's electricity supply system. A new 250/440-V three-phase distribution network with a 6,600-V three-phase feeder system has been designed to replace the old 200-V single-phase system now in operation.

A close estimate of the cost of the work involved, based on present-day prices, is £129,183, made up as follows: Substations and switchgear, £23,704; e.h.v. cable, £7,527; l.v. cable, £53,396; services, £14,267; consumers' apparatus, £25,289; and contingencies, £5,000. Not only will the new distribution network replace the existing system, but it will also provide reinforcement to the existing 250-V three-phase low-



At the inspection of the Maidenhead electricity distribution system: Mr. C. B. Thompson, the Mayor of Maidenhead (Alderman H. H. Neve), Mr. C. A. Britton and Councillor A. B. Gladwell

voltage system and complete ring mains on the 6,600-V three-phase transmission system, with the result that a duplicate high-voltage supply will be available in every substation throughout the area. Moreover, the protective system will be completed, so that in the event of a fault occurring in any particular district, the area will be automatically isolated from the remainder of the distribution system. Mr. Ross gives details of the new substations required, and says it is appreciated that this work will require to be postponed until after the war, but, since Government grants may be then available, it is recommended that the proposals shall be placed before the Electricity Commissioners now, so that the Council will be favourably placed to receive immediate sanction, together with any available State aid when conditions permit. The Town Council has decided that the proposals should be sent to the Commissioners.

Skelmersdale.—ELECTRICAL INSTALLATIONS.—The Urban District Council is to have electricity installed in the Town Hall, and electric lighting is to be installed at the fire station by the National Fire Service.

Surrey.—PURCHASE OF ELECTRICAL APPARATUS.—The County Council has agreed to an expenditure of £1,379 for the purchase of electrically heated food conveyors, trolleys, and other equipment.

Overseas

Australia.—DEVELOPMENT IN THE SOUTH.—It is reported in *Tenders* (Melbourne) that the South Australian Government has appointed a committee of three to report on the best means of developing electricity supplies in the State. The members are Judge H. K. Paine (chairman); Mr. H. P. Moss, Commonwealth Controller of Electricity; and Mr. B. Woodfull, city electrical engineer of Melbourne. Included in the matters to be investigated is the establishment of a power station at Port Augusta to serve the metropolitan area and country districts. The inquiry is considered necessary owing to the great expansion of secondary industries.

LISMORE POWER SCHEME.—The establishment of a coal-fired generating station at Lismore, N.S.W., is recommended by Mr. H. G. Carter, consulting engineer, in a report to the Clarence River County Council. Existing Diesel plant at Lismore has a capacity of 4,000 kW. Duplication of the main southern transmission line is also recommended.

Forthcoming Events

Institution of Electrical Engineers.—*North Midland Students' Section.*—Saturday, May 22nd, 2.30 p.m. Griffin Hotel, Leeds. Luncheon, annual meeting and film afternoon.

London Students' Section.—Monday, May 24th, 7 p.m. Annual general meeting followed by a film show.

Bristol Students' Section.—Saturday, May 29th, 3.30 p.m. Royal Baths Lounge, Bath. Annual meeting. Films will be shown after the meeting.

Association of Mining Electrical and Mechanical Engineers.—*Yorkshire North-West Branch.*—Saturday, May 22nd, 5.30 p.m. Hotel Metropole, Leeds. Paper (illustrated with slides): "Trend of Lighting in Industry," by Mr. J. H. Mollan. The proposed "Brains Trust" has been postponed until next month. Questions must be sent in by Saturday, June 5th.

British Institute of Radiology.—Saturday, May 22nd. Reid-Knox Hall, 32, Welbeck Street, London, W.1. 2.15 p.m. Annual general meeting. 3 p.m. Ordinary meeting and address by Dr. R. Fawcitt on "Radiological Evidences in Hæmatite Iron-ore Workers."

Birmingham Electric Club.—Monday, May 24th. Paper: "Infra-red Lamp Heating Applied to Paint Drying and other Industrial Processes," by Mr. F. E. Rowland, A.M.I.E.E.

Nottingham Society of Engineers.—Monday, May 24th, 6.30 p.m. Corporation Gas Showrooms, Parliament Street. Paper on "Air Conditioning," by Mr. A. G. Englebach, M.A. (Cantab.).

Women's Engineering Society.—Monday, May 24th, 6.30 p.m. Engineers' Club, Albert Square, Manchester. Address by Miss E. Sprott (B.B.C. Public Relations Officer) on "Women in Engineering at the B.B.C."

Institute of Welding.—Wednesday, May 26th, 6 p.m. Institution of Civil Engineers, Great George Street, London, S.W.1. Paper: "Welding Research and Development in the United States of America," by Mr. H. W. G. Hignett, B.Sc.(Eng.). Admission by ticket from the secretary of the Institute of Welding, 2, Buckingham Palace Gardens, S.W.1.

Electrodepositors' Technical Society.—*Midlands Centre.*—Tuesday, June 1st, 6 p.m. James Watt Memorial Institute, Gt. Charles Street, Birmingham. "Questions Box." Members are invited to forward any query or problem relating to electrodeposition work.

German Dams Breached

AN Air Ministry report on Monday last stated that in the early hours of the morning a force of Lancasters of Bomber Command led by Wing Commander G. P. Gibson, D.S.O., D.F.C., attacked with mines the dams at the Möhne and Sorpe reservoirs which controlled two-thirds of the water storage capacity of the Ruhr basin. Reconnaissance later established that the Möhne dam had been breached over a length of 100 yards and that the power station below had been swept away by the resulting floods.

The Eder dam, which controlled the head waters of the Weser and Fulda valleys and operated several power stations, was also attacked and was reported as breached. Photographs showed the river below the dam in full flood.

The attacks were pressed home from a very low level with great determination and coolness in the face of fierce resistance. Eight of the Lancasters did not return.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Johnson & Phillips, Ltd., held their annual meeting on May 13th, Mr. G. L. Wates (chairman) presiding. After reviewing the accounts for the past year, Mr. Wates said the electricity distribution undertakings at Dunoon, Ringmer and Westmorland continued to function as hitherto. The general body of the public in these areas had responded to the appeal of the Minister of Fuel to economise in the use of electricity.

Referring to the comments of the chairman at a recent company meeting on the profit motive in industry, Mr. Wates said there were at least three partners concerned in any industrial enterprise. They were the consumers, labour and what was generally referred to as the capitalist. It was as right and proper that the last-mentioned partner should have a reasonable and proper return for his contribution to the venture as it was that the other two partners should have value for what they gave. What was to be deprecated was profiteering and undue emphasis on the profit side of the business to the detriment of the other parties concerned. No one of the three partners alone could function without the other two. It would be more accurate to say that there were four partners, the fourth being the State, as so large a part of their revenue was now taken by way of taxation. In respect of last year's activities, whereas the shareholders would receive the sum of £60,000, they paid in salaries and wages £650,000 and were liable to pay to the State £310,000.

Their staff and works councils and the suggestion box had continued in active operation during the year, and in addition they had established various factory production committees composed of representatives of the workers and of the management. They had considerably extended the welfare section in the works, and had still further plans in view in this connection. They had inaugurated a works benevolent fund, built up partly by contributions from workers who voluntarily joined the fund, and partly by contributions by the company. At the present time 73 per cent. of the workers were members of this fund.

They had been paying special attention to the education of young people who joined their works, and had been closely associated with the Woolwich Polytechnic and other educational centres with a view to assisting their young people to get the best possible education in their trade. In common with other engineering firms, they were now subscribing to the Woolwich Polytechnic and a member of their staff had been appointed to the board of governors of that institution.

Brush Electrical Engineering Co., Ltd.—Presiding at the annual meeting on May 18th Sir Ronald W. Matthews (chairman) said that throughout the year the works had been fully occupied and there had been a further increase in turnover. The company had not only implemented the agreement between the Engineering and Allied Employers' National Federation and the trade unions as to joint production committees, but had also carried this collaboration a step further by the setting up of a Joint Production Consultative and Advisory Committee. This had been developed on sound constructive lines and there was no doubt that it had been helpful in the solution of some of the problems which at present confronted the majority of industrial undertakings.

War conditions made it impossible for him to give anything but a very incomplete picture of the activities of the company in 1942. Events since they last met had moved rapidly, and in the right direction, and they might be faced with the problems of peace at a substantially earlier date than they dared to hope for a year ago. To the solution of those problems from the industrial angle their company would be able to make a material contribution.

The Oriental Telephone & Electric Co., Ltd., reports a net revenue for 1942 of £34,941, as compared with £96,279 for 1941, to which is added £85,509 brought in, and after deducting dividends on the preference shares there is a balance of £107,235. It is proposed to pay a dividend of 4 per cent., less tax, for the year on the ordinary shares (against 10 per cent.) and to carry forward £84,427.

In a statement issued with the report and accounts, Sir A. Henry McMahon (chairman) says that so long as Singapore, Hong Kong and Burma remain in enemy hands the revenue of the company will continue to consist almost entirely of the interest on investments. They hope that they will be able to go on paying a modest dividend, though this may involve slight drafts on their carry-forward. Their reserves should be sufficient to provide all expenditure which may be necessary for post-war reconstruction. They have received official information that Mr. Boardman their manager, and one of their engineers are interned at Singapore. They have also heard that with one exception all the European staff of the Hong Kong Telephone Co. are safe.

Laurence, Scott & Electromotors, Ltd., report a trading profit for 1942 (after deducting E.P.T.) of £145,663, as compared with £139,647 for 1941, and after providing for depreciation, directors' fees and war damage contribution there is a balance of £108,202 (against £95,856). It is proposed to pay a first and final dividend on the "A" and "B" ordinary shares of 12½ per cent., less tax (same), to place £7,500 to pension fund and staff annuities, and £11,153 to general and other reserves. The balance carried forward is £5,483 (against £4,957 brought in).

The Ever Ready Co. (Gt. Britain), Ltd., reports a net profit for the year ended March 31st of £584,887, an increase of £12,953 as compared with the preceding year. The balance is struck after making provision for taxation and after charging £67,161 for depreciation. A sum of £140,000 is allocated to reserve and £21,126 is placed to staff fund and donations. As already

announced, the ordinary distribution for the year is maintained at 40 per cent., including 5 per cent. bonus. The balance carried forward is £100,148 (against £100,547 brought in).

The Ever Ready Co. (Ireland), Ltd., reports a profit for the year to March 31st of £12,005, as compared with £14,300 for 1941-42. The ordinary dividend for the year is maintained at 10 per cent., reserves receive £5,876 and the balance carried forward is £1,431 (against £1,502 brought in).

Newman Industries, Ltd., reports a profit of £67,182 for 1942, before meeting taxation. The provision for the latter this year not only covers liability for income tax and E.P.T. but also includes about £15,000 towards taxation of 1942 profits. The preferred ordinary and ordinary dividends are maintained at 8 and 20 per cent., respectively, and £10,000 is placed to general reserve. The company has issued 200,000 6 per cent. redeemable convertible cumulative preference shares of £1 each and 500,000 ordinary shares of 2s. each. From the proceeds of this issue 94,000 6 per cent. redeemable cumulative preference shares have been repaid and the balance (£197,500) has been used to reduce commitments to bankers.

Enfield Rolling Mills, Ltd.—Speaking at the annual meeting on May 14th, the chairman (the Earl of Verulam) said that the new subsidiary for refining aluminium to which he had referred at last year's meeting had exceeded their most optimistic expectations and had made a valuable contribution to the war effort. Their success in expanding their capacity for refining aluminium had been fully recognised by the Light Metals Control with whom their relations were most friendly.

Richard Johnson & Nephew, Ltd., report profits for the year to March 31st, after providing for tax and depreciation, of £42,042, as compared with £42,856 for the previous year, and a net profit of £40,792 (against £41,606). Staff and workmen's pensions receive £7,500, reserve £10,000 and the ordinary dividend for the year is maintained at 9 per cent. less tax. The balance carried forward is £38,184 (against £38,892 brought in).

The Calcutta Electric Supply Corporation, Ltd., is paying a final ordinary dividend of 3 per cent., making 6 per cent., tax free, for 1942. For the previous year the distribution was 7 per cent. in two equal payments.

Tube Investments, Ltd., has declared an interim dividend on the ordinary stock of 10 per cent. less tax (unchanged), and at the same rate relatively on the liaison ordinary shares.

The St. Austell & District Electric Lighting & Power Co., Ltd., is paying a final dividend of 6 per cent., again making 10 per cent. for the year.

The Rheostatic Co., Ltd., has declared a dividend of 12 per cent. for the past year (against 10 per cent.).

John I. Thornycroft & Co., Ltd., have announced an interim ordinary dividend of 5 per cent. (same).

The River Plate Electricity & Other Securities Corporation, Ltd., has announced a final dividend of 5 per cent., making 7 per cent. for the year (same).

Radio Rentals, Ltd., are paying an interim ordinary dividend of 5 per cent., less tax (against 4 per cent.).

New Companies

Callender-Suchy Developments Ltd.—Private company. Registered May 11th. Capital, £10,000. Objects: To acquire from C. T. Suchy, of 27, Upper Teddington Road, Hampton Wick, the benefit of a secret process relating to depositing metallic films on fibrous textile synthetic resin and plastic materials and other non-conductors of electricity, to enter into an agreement with the said C. T. Suchy and Callender's Cable & Construction Co., Ltd., etc. Subscribers: P. P. Mallinson, Hamilton House, Victoria Embankment, E.C.4, and R. G. Parr, 108a, Cannon Street, E.C.4. Secretary: P. Mallinson. Registered office: Hamilton House, Victoria Embankment, E.C.4.

Companies' Returns

Mortgages and Charges

De La Rue Plastics, Ltd.—(*a*) Charge dated March 26th, 1943, to secure (pursuant to a guarantee) £260,000 first mortgage debenture stock of Thomas De La Rue & Co., Ltd., charged on property at Walthamstow Avenue (registered title EX. 24,030), and (*b*) deed of guarantee and collateral security of same date, securing same £260,000 first mortgage debenture stock, charged on all the company's assets, present and future, except above registered property and certain other specified property in Walthamstow, Edmonton and Fife. Holders: Industrial and General Trust, Ltd., Pinners Hall, E.C.2.

Domestic Electric Rentals, Ltd.—Satisfaction in full on April 9th, 1943, of two mortgages or charges dated December 10th, 1938, and July 10th, 1939, and registered December 15th, 1938, and July 19th, 1939, securing £5,000 each.

Bankruptcies

R. F. Lovegrove (trading as Wallace Cook & Co.), 34, Green Lane, Northwood, electrical engineer.—This debtor applied for his discharge at the London Bankruptcy Court on May 11th, before Mr. Registrar Parton. The Official Receiver stated that debtor failed in July, 1939, with liabilities of £422, and the assets realised £79. The Registrar granted the discharge subject to a suspension of nine months.

A. H. Latham & R. C. Plant (Latham & Plant), wireless and electrical dealers, 35, Lowlands Road, Harrow, Middlesex.—Application for discharge to be heard on June 1st at Bankruptcy Buildings, Carey Street, London, W.C.2.

L. F. Kent, radio and electrical engineer, 32, High Street, Broadstairs.—Order made April 13th suspending discharge for seven days and that bankrupt be discharged as from April 20th, 1943.

J. H. Matthews, electrical dealer, 232, Town Street, Bramley, near Leeds.—Supplemental dividend of 5s. 4d. in the £, payable May 26th, at 24A, Bond Street, Leeds.

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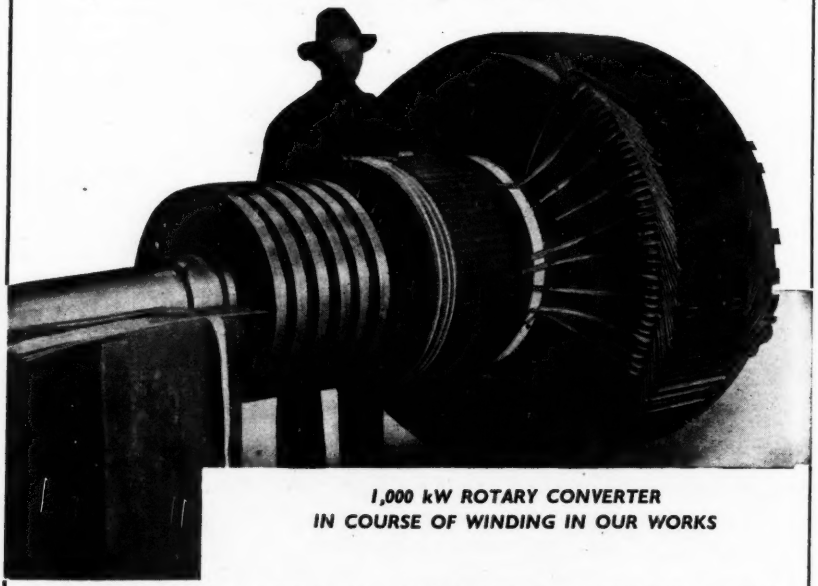

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STOCKS AND SHARES

TUESDAY EVENING.

THE enemy having been driven out of Africa, the Stock Exchange was expected by some people to acclaim the victory with a general rise in prices and buoyancy of markets. Instead of this, the tendency went rather the other way. Prices failed to respond ; there was no fresh support and profit-taking predominated over bullishness. What had previously happened was not sufficiently realised, namely, that the advance in prices had already synchronised with that of the Allies. When the expected happened and the battle for Tunisia was won, no new buyers came in to relieve the previous purchasers of stock they had bought with a view to selling when this anticipation was fulfilled. Therefore prices eased off and business in the House fell into a jogtrot state. Palestine Electric "A" shares rose 2s. 3d. upon the news of the victory in Tunisia.

Electricity Supply

Electricity supply shares have been a slightly better market upon announcements by various companies that their charges for electricity are to be increased. It is assumed that, before long, all the principal companies will have fallen into line over this policy, and that few consumers throughout the country will escape from additional charges. Investments sees in this move a likely compensation for the nervousness to which it was subjected some weeks ago by the proposal of the London & Home Counties J.E.A. for the absorption into a single body of the present separate entities. That the companies will be able to maintain for the duration of the war, and probably for some time afterwards, the dividends which they have been paying of late years is now taken as being practically assured. What may happen after the war is a matter brushed aside for the time being. It is noted with interest that prices of gas stocks have been advancing.

Cable & Wireless

Cable & Wireless stocks have shared in the dullish disposition of the markets. The ordinary has gone back to 80 and the preference to 112. The Anglo-American trio remained unchanged after the dividend declarations at the usual rates. The 6 per cent. preferred at 113½ gives £5 5s. 9d. per cent. on the money : Cable 5½ per cent. preference at 112 yields £4 17s. 9d. per cent. A relapse on the Wall Street Stock Exchange is reflected in 1s. decline in Canadian Marconi. What justification there was for the price to be run up to 14s. has not yet been revealed.

Radio share prices have moved irregularly. E. K. Cole 5s. shares are 1s. up, at 22s. 6d.; they came level at one moment with A. C. Cossor 5s. shares, but the latter went back to 22s. Pye deferred are unchanged at 22s. 6d. E.M.I. at 24s. have lost 9d. Radio Rentals attracted a fair amount of attention at 14s.

Miscellaneous Movements

Hopkinsons further improved to 62s. 6d. on the increase in the dividend. Reyrolles at 67s. 6d. are 1s. 9d. higher on the week. Maintenance of the previously paid dividend on Tube Investments was followed by a gain of 6d. to 95s. Siemens are 1s. better at 31s. 9d. Consolidated Signals at 111s. 3d. have put on half-a-crown, and a florin fall lowered Enfield Cables to 55s. Johnson & Phillips have recovered the deducted dividend, and have risen a further 6d. to 69s. 6d. The accounts show a satisfactory increase in profits. Thorn Electric preference are $\frac{1}{16}$ better at 22s. 6d. In the heavy industries group, Babcock & Wilcox eased off to 51s. in spite of the dividend showing no change. Vickers, a few pence lower at 20s., pay at that price 5 per cent. on the money. A similar yield is offered by Allen Wests, upon a sixpenny fall to 7s. 6d. Ever Ready shares are firm at 38s.

Last week's rise in Calcutta Trams tempted a little selling, and the price went back to 31s. 3d. Some of the holders preferred to get out while the going was good, rather than wait and see what action, if any, the Calcutta Corporation will take in connection with its right to acquire the undertaking. The Calcutta Electric is paying a final dividend of 3 per cent. net, making 6 per cent. net for the year, against 7 per cent. net in the previous twelvemonth. International "Tel. & Tel.", after their dramatic rises, have come to rest at 18¼.

Brazilian Tractions

The vicissitudes of fortune have seldom been more strikingly illustrated than in the case of the Brazilian Traction Company. In 1928, the company paid a 6 per cent. dividend, and the shares, just before each share was divided into four new shares, stood at 238. In 1929, the new shares went up to 84¾, from which the price descended to 7¾, without any "big figure," in 1934. Three years ago, the price was down to 5, the highest in that year being 12⅜. For three years, 1933-35 inclusive and also in 1939-40, no dividends were paid. To-day's 32¾ is 4¼ dollars higher than it was at the beginning of this month.

Oriental Telephone

The lean years which we must expect so long as the war lasts will call for some supplement to the revenue earned by the Oriental Telephone & Electric Company. This is

(*Continued on page* 701)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend: Previous	Dividend: Last	Middle Price May 18	Rise or Fall	Yield p.c.
Home Electricity Companies					£ s. d.
Bournemouth and Poole	12½	12½	57/6	..	4 6 10
British Power and Light	6	7	31/–	..	4 10 4
City of London	7	7	30/–	..	4 13 4
Clyde Valley	8	8	39/–	..	4 2 0
County of London	8	8	38/6	..	4 3 2
Edmundson's: 7% Pref.	7	7	34/–	..	4 2 4
Ord.	6	6	29/–	..	4 2 9
Elec.Dis.Yorkshire	9	9	44/6	..	4 1 0
Elec. Fin. and Securities	12½	12½	51/–	..	4 18 1
Elec. Supply Corporation	10	10	46/6	..	4 6 0
Isle of Thanet	2	Nil	16/–	..	—
Lancs. Light and Power	7½	7½	35/–	..	4 5 9
Llanelly Elec.	5½	6	26/–	..	4 12 4
Lond.Assoc.Electric	4	3	21/6	+6d.	2 15 10
London Electric	6	6	26/6	..	4 10 7
London Power Red. Deb.	5	5	104½	..	4 15 7
Metropolitan E.S.	8	8	38/6	..	4 3 2
Midland Counties	8	8	38/6	..	4 3 2
Mid. Elec. Power	9	9	43/–	..	4 3 9
Newcastle Elec.	7	7	31/–	..	4 10 5
North Eastern Elec. Ordinary	7	7	32/–	..	4 7 6
7% Pref.	7	7	34/–	−1/6	4 2 4
Northampton	10	10	47/6	..	4 4 0
Notting Hill 6% Pref. (£10)	6	Nil	9¾	..	—
Northmet Power: Ordinary	7	7	36/6	−6d.	3 16 8
6% Pref.	6	6	31/–	−6d.	3 17 5
Richmond Elec.	6	6	26/–	..	4 12 4
Scottish Power	8	8	37/6	−1/–	4 5 4
Southern Areas	5	5	23/–	..	4 7 0
South London	7	7	26/–	..	5 7 8
West Devon	5	5	23/6	..	4 5 0
West Glos.	4½	3½	23/–	..	3 0 10
Yorkshire Elec.	8	8	40/–	..	4 0 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	5/3	+3d.	—
Calcutta Elec.	7*	6*	35/–	−6d.	3 8 7
Cawnpore Elec.	10	10	30/–	..	6 13 4
East African Power	7	7	32/–	..	4 7 6
Jerusalem Elec.	7	5	26/–	+6d.	3 17 0
Kalgoorlie (10/–)	7½	5	9/–	..	5 11 1
Madras Elec.	6*	4*	24/–	..	—
Montreal Power	1½	1½	27½	..	5 7 2
PalestineElec."A"	Nil	4*	41/3	+2/3	1 18 9
Perak Hydro-elec.	6	7	9/–	..	—
Shawinigan Power	83cts.	90cts.	19	..	—
Tokyo Elec. 6%	6	6	19	..	—
VictoriaFallsPower	15	15	4½	..	3 13 0
WhitehallInv.Pref.	—	—	24/6	+6d.	4 18 0

Company	Dividend: Previous	Dividend: Last	Middle Price May 18	Rise or Fall	Yield p.c.
Public Boards					£ s. d.
Central Electricity: 1955-60 (Civil Defence)	—	3	100	..	3 0 0
1955–75	5	5	115	..	4 7 0
1951–73	4½	4½	109	..	4 2 7
1963–93	3½	3½	103½	..	3 7 8
1974–94	3¼	3¼	101	..	3 3 9
LondonElec.Trans. Ltd.	2½	2½	96½	..	2 11 10
London & Home Counties 1955–75	4½	4½	111	..	4 1 1
Lond.Pass.Trans.: A	4½	4½	120½	−2	3 11 6
B	5	5	118½	−2	4 1 5
C	2⅞	3	62½	−1	4 16 0
WestMidlandsJ.E.A. 1948–68	5	5	110	..	4 11 0
Telegraph and Telephone					
Anglo-Am. Tel.: Pref.	6	6	113½	..	5 5 9
Def.	1½	1½	28	..	5 7 2
Anglo-Portuguese	8	8	24/6	..	6 10 7
Cable & Wireless: 5½ Pref.	5½	5½	112	−1½	4 17 9
Ord.	4	4	80	−1	5 0 0
CanadianMarconi	$1 Nil	4cts.	10/–	−1/–	—
Globe Tel. & Tel.: Ord.	8¼*	5*	35/–	..	2 17 2
Pref.	6	6	29/3	..	4 2 3
GreatNorthernTel. (£10)	Nil	Nil	23	..	—
Inter. Tel. & Tel.	Nil	Nil	18½	..	—
Marconi-Marine	7½	7½	33/6	..	4 9 7
Oriental Tel. Ord.	16	10	37/–xd	..	—
Telephone Props.	6	Nil	14/–	..	—
Tele. Rentals (5/–)	10	10	11/3	..	4 9 0
Traction and Transport					
Anglo-Arg. Trans.: First Pref. (£5)	Nil	Nil	5/–	..	—
4% Inc.	Nil	Nil	14	..	—
Brit.Elec.Traction: Def. Ord.	45	45	1095	..	4 2 2
Pref. Ord.	8	8	170	..	4 14 2
Bristol Trams	10	10	51/–	..	3 18 6
Brazil Traction	$½	$1	32⅜	+½	—
Calcutta Trams	8	5½	31/3	−⅛	3 10 4
Cape Elec. Trams	5	6	25/–	..	4 16 0
Lancs. Transport	10	10	44/3	..	4 10 4
Mexican Light 1st Bonds	5	5	101½	..	4 18 6
Rio 5% Bonds	5	5	104½	..	4 15 9
Southern Rly.: 5% Prefd.	5	5	76½	−3	6 10 7
5% Pref.	5	5	115	−2	4 7 0
T. Tilling	10	10	53/3	..	3 14 5
West Riding	10	10	43/–	..	4 13 0

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price May 18	Rise or Fall	Yield p.c.
Equipment and Manufacturing					£ s. d.
Aron Elec. Ord...	7½	10	40/–	..	5 0 0
Assoc. Elec.:					
Ord.	10	10	50/–	..	4 0 0
Pref.	8	8	40/–	..	4 0 0
AutomaticTel.&Tel.	12½	12½	60/6	..	4 2 8
Babcock & Wilcox	11	11	51/–	−1/–	4 6 3
British Aluminium	10	10	50/6	..	3 19 2
British Insul. Ord.	20	20	5 7/16	..	3 13 6
British Thermostat (5/–)	18½	18½	17/6	..	5 5 9
British Vac.Cleaner (5/–)	10	15	24/3	..	3 1 10
Brush Ord. (5/–)	6	8	8/3	−3d.	4 17 0
Burco (5/–) ..	15	15	14/3	..	5 5 1
Callender's ..	15	15	82/–	..	3 13 0
ChlorideElec.Storage	15	15	80/–	..	3 15 0
Cole, E. K. (5/–)	7	10	22/6	+1/–	2 4 6
Consolidated Signal	17	24	5 5/8	+1/4	4 6 0
Cossor, A. C. (5/–)	15	10*	22/–	−6d.	3 8 4
Crabtree (10/–) ..	17½	17½	37/6	..	4 13 4
Crompton Parkinson Ord. (5/–) ..	20	20	25/–	..	4 0 0
E.M.I. (10/–) ..	6	6	24/–	−9d.	2 10 0
Elec. Construction	10	10	44/–	..	4 11 0
Enfield Cable Ord.	12½	12½	55/–	−2/–	4 11 0
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric	10	10	48/–	..	4 3 4
Ensign Lamps(5/–)	25	25	21/3	..	5 17 8
Ericsson Tel.(5/–)	22†	20†	47/6	..	2 2 2
Ever Ready (5/–)	40	40	38/–xd	..	5 5 3
Falk Stadelmann	7½	7½	30/6	..	4 18 4
Ferranti Pref. ..	7	7	28/9	..	4 17 5
G.E.C.: Pref. ..	6½	6½	34/3	..	3 16 0
„ Ord. ..	17½	17½	89/–	..	3 18 8
Greenwood&Batley	15	15	38/–	..	8 0 0
HallTelephone(10/–)	12½	12½	26/3	..	4 17 0
Henley's (5/–) ..	20	20	25/6	..	3 18 6
4½% Pref. ..	4½	4½	23/–	..	3 18 3
Hopkinsons ..	15	17½	62/6	+9d.	5 12 0
India Rubber Pref.	5½	5½	20/–	..	5 10 0
Intl. Combustion	30	30	6½	..	4 17 10
Johnson & Phillips	15	15	69/6xd	+2/–	4 6 3
LancashireDynamo	20	22½	90/–	..	5 0 0
Laurence,Scott(5/–)	15	12½	12/–xd	..	5 4 2
London Elec. Wire	7½	7½	31/6	..	4 15 3
Mather & Platt	10	10	50/–	..	4 0 0
Met.Elec.CablePref.	5½	5½	21/3	..	5 3 6
Murex	20	20	5¾	..	3 14 6
Pye Deferred (5/–)	25	25	22/6	..	5 11 1
Revo (10/–) ..	20	17½	35/6	..	4 18 7
Reyrolle	12½	12½	67/6	+1/9	3 14 0
Siemens Ord. ..	7½	7½	31/9	+1/–	4 14 7
Strand Elec. (5/–)	4	7½	6/6	..	5 15 5
Switchgear & Cowans (5/–) ..	10	20	15/6	..	6 9 0
T.C.C. (10/–) ..	5	5	15/–	..	3 6 8
T.C. & M. ..	10	10	47/–	..	4 5 1
TelephoneMfg.(5/–)	9	9	12/–	..	3 15 0
Thorn Elec. (5/–)	20	20	21/–	+3d.	4 15 5
Tube Investments	20	20	95/–	+6d.	4 4 2
Vactric (5/–) ..	Nil	Nil	13/–	..	—
Vickers (10/–) ..	10	10	20/–	−3d.	5 0 0
WalsallConduits(4/–)	55	55	45/6	..	4 16 9
Ward & Goldstone (5/–)	20	20	22/6	..	4 9 0
WestinghouseBrake	10	12½	66/6	..	3 15 2
West, Allen (5/–)	7½	7½	7/6	−6d.	5 0 0

* 5 per cent. tax-free. † Dividends free of Income Tax.

Stocks and Shares (*Continued from page* 699)

pointed out in the statement of the chairman circulated in advance of the company's annual meeting on Friday in this week. He repeats this, in explanation of the building up of the carry forward. The company's revenue is almost entirely dependent upon the interest on its investments, so long as Singapore, Hong Kong and Burma remain in enemy hands. This means that shareholders can look for no more than a modest dividend during the war period, although the assets, calculated upon a conservative basis, work out to 38s. per share. And the present market price is 37s. ex dividend.

Marconi Marine

Declaration of the usual 7½ per cent. dividend for the year was expected from the Marconi Marine company, and the price of the shares remained unchanged at 33s. 6d. At this price, the return on the money is £4 9s. 7d. per cent. How the war has affected the company it is difficult to gather. That part of its assets have been seized by the Japanese is common knowledge, and the company has taken steps to provide against this loss. A dividend of 7½ per cent. has been declared annually since 1932. Five years ago, a bonus of 2½ per cent. was added, but this is hardly likely to be repeated during the war.

Whitehall Electric

A good many proprietors of the old Whitehall Electric 7½ per cent. preference shares are exchanging the new ordinary which they received in respect of their previous holding, and are putting the money into the new 6 per cent. preference. The ordinary shares can be sold at about 7s. 6d., and the preference bought at 25s. or thereabouts. One has to say "thereabouts," because the floating supply of preference is running short. If this exchange movement continues, the price of the preference will have to go up, in spite of the fact that it already looks high enough having regard to the nature of the security. To justify parting from the ordinary, the sellers maintain that they are not likely to receive more than 1, or possibly 2, per cent. dividend on the ordinary for duration of the war. It may possibly pay better, continues this contention, to turn the ordinary into preference by selling the former and reinvesting the proceeds in the preference.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

ACRU Electric Tool Manufacturing Co., Ltd., and M. P. Rubert.—" Electric resistance heating elements." 1418. February 3rd, 1942. (552942.)

Aktiebolaget Elektrolux. — " Refrigerator cabinets." 6410/42. June 17th, 1941. (552867.)

Allmanna Svenska Elektriska Aktiebolaget.—" Regulating transformers." 15220/41. December 7th, 1940. (552914).

British Thomson-Houston Co., Ltd.—" Waste disposal apparatus." 6508/42. May 13th, 1941. (552868.) " Electric motor control systems." 9394/41. July 24th, 1940. (552886.) " Vacuum cleaners." 8417/42. June 24th, 1941. "(552975.) " Flat irons." 9057/42. July 2nd, 1941. (552981.) " Elastic-fluid turbine arrangements." 9736/42. July 17th, 1941. (552983.)

British Thomson-Houston Co., Ltd., and J. Dyson.—" Electric transformers." 14580. November 12th, 1941. (Addition to 522671.) (552815.)

British Thomson-Houston Co., Ltd., and H. De B. Knight.—" Devices of the electrostatically controlled arc discharge type." 12290. September 23rd, 1941. (552846.)

Carnegie-Illinois Steel Corporation.—" Method of electroplating with tin and alloys thereof." 9511/42. December 10th, 1941. (552982.)

Concrete Utilities, Ltd., and C. A. Marques.—" Electric heating of structures." 14000. October 31st, 1941. (552910.)

J. A. Crabtree & Co., Ltd., H. F. McLoughlin, W. E. Hill, R. W. Morgan and T. D. G. Wintle.—" Box fastenings." 6418. May 12th, 1942. (552964.)

Crompton Parkinson, Ltd., V. S. Cass and H. O. Burge.—" Means for the automatic and other electric control of variables." 16634 December 24th, 1941. (552823.)

J. A. Dorrat and Metropolitan-Vickers Electrical Co., Ltd.—" Welding machines." 694. January 16th, 1942. (552936.)

Electrical Improvements, Ltd., A. Howell and C. V. Rundell.—" Roof ventilators for buildings." 13692. October 24th, 1941. (552900.)

General Electric Co., Ltd., R. L. Breadner and C. H. Simms.—" Sealing electrical conductors through vitreous walls." 6233. May 8th, 1942. (552963.)

A. C. Gunstone and R. A. Lambert.—" Overload protection on X-ray control apparatus." 1688. February 9th, 1942. (552945.)

Hazeltine Corporation. — " Carrier-signal frequency detector systems." 9247/41. August 12th, 1940. (552807.)

Igranic Electric Co., Ltd.—" Apparatus for controlling the mixing of combustible gases." 12495/41. September 28th, 1940. (552894.)

International Polaroid Corporation.—" Preparation of light polarising images." 6187/42. March 27th, 1941. (552866.) " Light polarising devices." (629/42.) February 26th, 1941. (552935.)

Landis & Gyr Soc. Anon. — " Contact controlling mechanism for use on automatic electric circuit-breakers or switches." 4944/42. May 7th, 1941. (552839.)

Linde Air Products Co.—" Welding metal elements." 2378/41. March 1st, 1940. (552806.)

Marconi's Wireless Telegraph Co., Ltd.—"Phase modulation." 1885/42. February 12th, 1941. (552946.)

Marconi's Wireless Telegraph Co., Ltd., J. D. Peat and J. Vickers.—" Radiogoniometer direction finders." 12383. September 24th, 1941. (552891.)

Measurement, Ltd., and C. F. Clifford. " Prepayment mechanism for meters." 885. January 21st, 1942. (552932.)

T. D. Ward-Miller.—" Heating elements of electrical soldering irons." 4755. April 10th, 1942. (552837.)

C. W. M. Morris.—" Signal lamps." 5309. April 21st, 1942. (552856.)

Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken).—" Electric circuit arrangement for use in maintaining a constant output direct voltage applied to a load fed from a supply having a variable direct voltage." 16583. December 23rd, 1941. (552822.) " Apparatus for stereophonically recording, transmitting and reproducing sound." 14069. October 31st, 1941. (552854.) " Wireless aerial systems." 14068. October 31st, 1941. (552911.) " Means for use in the detection of traces of foreign gases, vapours or mists in the atmosphere." 11335. September 4th, 1941. (552954.)

Radio Gramophone Development Co., Ltd., and H. F. Duffell.—" Carrier current communication system." 15041. November 21st, 1941. (552819.)

A. Reyrolle & Co., Ltd., D. F. Amer and A. Rawling.—" A C electric circuit-breakers of the gas-blast type." 12447. September 25th, 1941. (552924.)

A. Reyrolle & Co., Ltd., D. F. Amer and W. H. Webb.—" Electric circuit-breakers of the gas blast type." 12448. September 25th, 1941. (552893.)

A. Rylands.—" Coupling device for repairing broken overhead cables such as electrical transmission lines." 410. January 12th, 1942. (552825.)

Standard Telephones & Cables, Ltd.—" Piezo-electric crystal apparatus." 4070/42. October 19th, 1940. (552835.) " Magnetic cores." 7457/42. March 8th, 1941. (552968.)

Standard Telephones & Cables, Ltd. (International Standard Electric Corporation).—" Electrical signalling system with remote control." 6546. May 14th, 1942. (552869.) " Electromagnetic wave collector systems." 2593. February 27th, 1942. (552949.) "Keying method for radio transmitters." 4065. March 27th, 1942. (552959.)

A. H. Stevens (Electro Manganese Corporation).—" Cathodes for the electrolytic deposition of manganese thereon, and methods of making such cathodes." 8846. June 26th, 1942. (552978.)

E. J. W. Watkinson.—"Radiographic camera systems." 12327. September 23rd, 1941. (552923.)

F. Watson (Aktiebolaget Elektrolux).—"Absorption refrigerating apparatus." 6549. May 14th, 1942. (552966.)

W. West and W. Geipel, Ltd.—"Electromagnetically operated contactor switches." 1068. January 26th, 1942. (552940.)

Westinghouse Electric International Co.—"Distribution of surge voltages in the windings of electrical apparatus." 8083/42. June 14th, 1941. (552874.) "Replica electric distribution networks." 2159/42. February 18th, 1941. (552947.) "Trip devices for electric circuit-breakers." 6448/42. May 15th, 1941. (552965.) "Bimetallic thermostats." 7428/42. February 27th, 1941. (552967.)

Zenith Radio Corporation.—"Wave amplitude limiting device for signal transmission systems." 1424/42. December 26th, 1940. (552943.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—NEW SOUTH WALES.—Sydney County Council Electricity Department. June 17th. 18,000-kVA power transformers (Spec. 673) and high-voltage testing equipment (Spec. 679; time extended) for Pyrmont power station.

June 24th. Steam generating plant, Pyrmont section B (Spec. 650).

July 8th. 50,000-kW steam turbo-alternator, Pyrmont section B (Spec. 651).

July 22nd. Reactor tie isolating equipment, Bunnerong (Spec. 632).

July 29th. 33-kV cables for duct lines (Spec. 628).

VICTORIA. — State Electricity Commission. June 2nd. Outdoor 2,200-V switchgear and accessories (Spec. 42-43/49).

Slough.—May 26th. Town Council. Supply and erection of (1) borehole pump (without motor); and (2) horizontal electrically driven pumping set for a duty of 85,000 gal. per hr. against 285 ft. head. Specifications and form of tender from E. Gardner Thorp, waterworks engineer, Town Hall. Tenders to J. H. Warren, town clerk.

Orders Placed

Australia.—The following acceptances of tenders are noted in February and March issues of *Tenders* (Melbourne) :—

COMMONWEALTH. — P.M.G.'s Department. Electron tubes, Con. 4239 (£1,025 plus exchange); resistors, Con. 6275 (£533 plus ex.); and lamps, lamp-caps and sockets, Con. 6250 (£2,351).—Siemens (Aust.) Pty. Jacks and number plates, Con. 4984 (£1,880 plus ex.); carrier telephone equipment, Con. 5918 (£47,469).—Standard Telephones & Cables. Lamps, lamp-caps and sockets, Con. 6233. (£2,283).—British General Electric Co. Pty. Insulated wire, Con. 6248 (£1,902 plus ex.).—W. T. Henley's Telegraph Works Co. Telephone interruption cable, Con. 6273 (£5,055).—Enfield Cable Works (A'sia) Pty. Transmitter carbons and electrodes, Con. 6344 (£436 plus ex.).—Morgan Crucible Co., England.

Accumulator cells, Con. 6357 : Clyde Engineering Co. (£782); Exide Batteries of Aust. Pty. (£1,073); Tudor Accumulator Co., London (£1,171).

Department of Supply and Shipping. Stranded cable, Con. 1578 (£1,042).—British Insulated Cables. Cartridge fuses and fittings, Con. 1485 (£282).—Siemens (Aust.) Pty. Stainless steel drums (£1,540).—Birmingham Electric Furnaces. Exide cells, Con. 15972 (£6,021).—Exide Batteries of Aust. Pty.

Refrigerators, Con. 18247 : Jorgensen Bros. (£1,242); Dangar, Gedge & Mulloch (£669); British G.E.C. (£2,225).

Electric cables, Con. 1198 : Noyes Bros. (£1,554); Aust. G.E. (£898); British G.E.C. (£1,914); Siemens (Aust.) Pty. (£1,090); A. Beal Pritchett (£407); Enfield Cable Works Pty. (£462); H. Rowe & Co. Pty. (£1,872); W. T. Henley's Telegraph Works Co. (£1,696); Johnson & Phillips (£1,874); Liverpool Electric Cable Co. (£918).

V.i.r. cable, Con. 18035 : W. Adams & Co. (£245); Noyes Bros. (£1,587); Liverpool Electric Cable Co. (£428); Johnson & Phillips (£471); Australian G.E. (£712); Henley's (£1,157); H. Rowe & Co. (£3,339); British G.E.C. (£1,229).

Electric lamps, Con. 18554 : British G.E.C. (£371); Australian G.E. (£371).

Barrow-in-Furness. — Electricity Committee. Accepted. Spares for coal handling plant (£101). —Naylor Bros.

Bradford.—Electricity Committee. Accepted. Three-phase static transformers to December 31st.—Yorkshire Electric Transformer Co.

Glasgow.—Police Committee. Accepted. Two telescopic dipole aerials for attachment to police wireless vans.—Belling & Lee. Two mains power supply units, required in connection with the police wireless scheme.—Stratton & Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Amersham.—Agricultural houses, The Lee, Little Missenden, Ashley Green, and Seer Green, for R.D.C.; H. E. Buxton, clerk, Council Offices, High Street, Amersham, Bucks.

Barrow-in-Furness.—Workshop ; J. J. & H. Callow.

Bradford.—Improvements to cold stores (£2,750); G. Hall, Williams & Co.

Caernarvonshire.—Remand home, Prestatyn; W. Ll. Jones, county architect, Caernarvon.

Chanctonbury.—Houses, Ashurst and Small Dole, for R.D.C.; surveyor, Council Offices, Storrington, Sussex.

Coventry.—Two school air-raid shelters for 200 children each; D. E. E. Gibson, city architect, 1a, Warwick Row.

Cuckfield.—Houses at Hurstpierpoint for R.D.C.; L. Manwaring, clerk, Rural Council Offices, Haywards Heath.

Derby.—Fire station at Hathersage; Chief Regional Officer, National Fire Service, Derby.

Dundee.—Building for trade school; city architect.

Guildford.—Nursery at Onslow (£3,743); R. Holford & Co., Ltd., builders, Walnut Tree Close.

Halliwell.—Works canteen; Architects' Dept., Bleachers' Association, Ltd., Blackfriars House, Manchester, 3.

Hambledon.—Houses at Cranleigh, Chiddingfold, and Dunsfold for R.D.C.; P. G. Williams, surveyor, Bury Fields, Guildford.

Ilkeston.—Pasteurising plant buildings; Mr. H. Moss.

Restaurant, Nottingham Road; borough engineer.

Littlehampton.—Fire station additions, Maltravers Road and Surrey Street; N.F.S. Divisional Officer.

Liverpool.—Extension to main building at Cleaver Sanatorium; L. H. Keay, city architect, Blackburn Chambers, Dale Street.

London.—PADDINGTON.—Erection of nursery, Westbourne Park Road; town clerk, Town Hall, W.2.

Luton.—Extensions to Luton and Dunstable Hospital, Dunstable Road; secretary.

Manchester.—Health and child welfare centre, Collyhurst; G. Noel Hill, city architect, Town Hall, Albert Square, Manchester, 2.

Works extensions; B. Waterhouse, architect, 134, Deansgate.

Canteen and store; H. Greenberg, Ltd., thread manufacturers, 12, Grove Street, Bury New Road.

Middlesbrough.—Central kitchen at Lower Street School; W. E. Price, builder.

Newcastle-on-Tyne.—Cancer block (60 beds) at Royal Infirmary; secretary.

Wartime nursery at the Babies' Hospital for the City Council; E. Thompson, builder, 12, Grey Street.

Air-raid shelter at Heather Laundry; T. K. Page, Son & Bradbury, 75, King Street, South Shields.

Newton Heath.—Works canteen; A. V. Roe & Co., Ltd.

Northampton.—Extensions to hospital (tuberculosis); R. A. Winfield, borough surveyor.

Northumberland. — Agricultural workers' houses at Netherwitton, Longhorsley, and Hartburn; Mauchlen & Weightman, Saville Row, Newcastle-on-Tyne.

Nottingham.—Pump house; city surveyor, Guildhall.

Ossett.—Central meals kitchen (£3,000); J. Booth, town clerk.

Rickmansworth.—Fire station (£1,773) for N.F.S.; Charles Brightman & Son, Ltd., builders, Ebury Road Works, Watford.

Romney Marsh.—Houses (14) for R.D.C.; E. A. Jackson, architect, 13, North Street, Ashford, Kent.

Sheffield.—Offices, stores, etc.; Portass Lathe & Machine Tool Co.

Sunderland.—Workshops; J. Potts & Son, architects, John Street.

Swindon.—N.F.S. stores and workshop; Regional Commissioner, Bristol.

Tadcaster.—Wartime nursery, near Tadcaster West Council School for R.D.C.; J. Worthington, surveyor, Station Road.

Trafford Park.—Works canteen; E. Taylor & Co., Joinery Works, Second Avenue.

Wakefield.—Crematorium and buildings; S. G. Wardley, city engineer, Town Hall.

Wallsend-on-Tyne.—Rescue station, High Farm Estate; J. E. Blench, borough engineer, Town Hall.

Warwickshire.—Hospital additions, Solihull; county architect, Warwick.

Widnes.—Pumping plants; borough surveyor, Town Hall.

Wolverhampton.—Combined rescue and zone station; W. M. Law, borough surveyor, Town Hall.

Workington.—Pump house for Water Department; waterworks engineer, Town Hall.

I.M.E.A. Scottish Centre

A CIVIC welcome was extended by Lord Provost Biggar, Glasgow, to the delegates attending the annual meeting of the Scottish Centre of the Incorporated Municipal Electrical Association on May 14th. Expressing the belief that a fight was approaching in regard to distribution, the Lord Provost urged that nothing should be given away by the municipal undertakings. Rather should they be prepared to embrace other areas which were willing to come under their control.

Public ownership of the entire distribution of electrical energy was advocated by Mr. F. Newey, Lincoln, president of the Association, at a luncheon given by the Corporation in the City Chambers. As representing local authorities they felt that such a step would be the greatest improvement that could take place within the industry, he said. It was impossible to state how far they would be successful in that direction in the future. They knew that companies were very much concerned about the outlook, both in regard to the nation and to the industry, but as local authority representatives they had but one objective, which was the development and encouragement of the industry under public control. They were facing the possibility of reorganisation of electricity supplies, and no opportunity should be lost in determining what was best for the majority. Electricity was now being used in every direction far in excess of the dreams of the most optimistic engineer. The whole community had now become electrically minded, and the members of the Association had to take steps to meet that demand.